



## ROADWAY DESIGN CRITERIA AND STANDARDS

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## TABLE OF CONTENTS

Chapter	Title	Page
1	Roadway Design and Technical Criteria	1.1
2	Access Requirements and Criteria	2.1
3	Pavement Design and Technical Criteria	3.1
Appendix	Roadway Standards	

## **CHAPTER 1**

# **ROADWAY DESIGN AND TECHNICAL CRITERIA**

## TABLE OF CONTENTS

Section	Title	Page
1.1	General .....	1.1
1.2	Roadway Design and Technical Criteria .....	1.1
1.3	Sidewalks, Bicycle Lanes, Curbs, Gutters, and Driveways .....	1.29
1.4	Drainage .....	1.31
1.5	Horizontal Alignment .....	1.33
1.6	Vertical Alignment .....	1.39
1.7	Intersections .....	1.41
1.8	Curb Return Profiles .....	1.43
1.9	Connection with Existing Roadways .....	1.43
1.10	Off-Site Design .....	1.44
1.11	Acceleration/Deceleration Lanes .....	1.45
1.12	Bus Pullout Lanes .....	1.45
1.13	Construction Traffic Control .....	1.45
1.14	Median Islands .....	1.47
1.15	Signage and Striping Criteria .....	1.48
1.16	Fire Lanes .....	1.52
1.17	Required Right-of-Way Designation .....	1.52
1.18	Bridges .....	1.52
1.19	Traffic Calming .....	1.53

# TOWN OF SUPERIOR

## CHAPTER 1 ROADWAY DESIGN AND TECHNICAL CRITERIA

### 1.1 GENERAL

This section sets forth the minimum design and technical criteria and specifications to be used in the preparation of all roadway plans.

1.1.1 Within this chapter on Roadway Design and Technical Criteria, the AASHTO "Green Book" refers to "A Policy on Geometric Design of Highways and Streets - 2001", or the most recent edition as published by the American Association of State Highway and Transportation Officials.

### 1.2 ROADWAY DESIGN AND TECHNICAL CRITERIA

The Town has adopted a Transportation Plan based on traffic volumes, land use and expected growth. This Functional Street Classification Plan designates streets as private, alleys, local, collector (major and minor), arterial (major and minor), commercial and office (See Tables 1.1 and 1.2). The following criteria apply to each classification. Standard roadway cross sections along with other related drawings and details are presented in the Appendix.

#### 1.2.1 Planning Principles for Local Circulation Systems

Basic considerations in the design of local circulation systems must recognize the following factors:

Safety: for both vehicular and pedestrian traffic.

Efficiency of Service: for all users.

Livability: especially as affected by traffic elements in the circulation system.

Economy: of both construction and use of land.

Each of the following principles is an elaboration on one or more of these four factors. The principles are not intended as absolute criteria, since instances may appear where certain principles conflict. Therefore, the principles should be used as guides to proper systems layout.

#### a. Ensure Vehicular and Pedestrian Access

The primary function of local streets is to serve abutting properties.



Street widths, placement of sidewalks, patterns of streets and number of intersections are related to safe and efficient access to abutting lands.

b. Minimize Through Trips

Through traffic on local and collector streets increases the average speed and volume and thus the accident potential, thereby reducing residential amenities. Through traffic can be discouraged by creating a circuitous route between neighborhoods and higher volume streets and by channelizing or controlling median crossings along peripheral routes.

c. Control Access to Arterials

Local circulation systems and land development patterns should not detract from the efficiency of peripheral arterial facilities. Ideally, land development should occur so that no local streets require direct access to arterial routes. The number of access points between the local circulation system and the arterial system should be minimized. Intersections along arterial routes should be properly spaced for efficient signalization and traffic flow. The streets that do intersect the arterial system will tend to have high volumes since they are the only exit points.

d. Discourage Speeding

Residential streets should be designed to discourage fast movement (more than 25 m.p.h.), through the use of curvilinear alignments and circuitous routes in the street system.

e. Minimize Pedestrian – Vehicular Conflicts

Pedestrian travel from within the area to points outside should require a minimum of street crossings. Sometimes this may be achieved through proper design of street patterns, land use arrangements and pedestrian routes. Typical methods include use of cul-de-sacs and loop streets, special pedestrian routes or walkways and the proper placement of high pedestrian traffic generators. In general, while vehicular flow must be outward-oriented to the peripheral arterials, pedestrian travel should be inward-oriented to avoid these heavier vehicular flows.

f. Minimize Space Devoted to Street Use

It is desirable to minimize local street mileage to reduce construction and maintenance costs as well as to permit the most economic land use.



Street should also have an appearance commensurate with their function. They should be in keeping with the residential character.

g. Relate Street to Topography

Local streets will be more attractive and economical, if they are constructed to closely adhere to topography. The important role that streets play in the overall storm drainage system can be enhanced by using the topography of the area.

h. General Roadway Layout Criteria

1. The arrangements of streets should permit economical and practical patterns, shapes and sizes of development parcels. Streets as a function of land use must not unduly hinder the development of land. Distances between streets, number of streets, and related elements all have a bearing on efficient subdivision of an area. Access to adjoining properties should also be encouraged.
2. Where a development or subdivision abuts or contains an existing or proposed arterial street or highway, the Planning Commission may require adequate protection of the adjoining lots and/or require separation of through and local traffic. Such adequate protection may include service streets, reverse frontage lots with screen planting in a reservation strip along the rear property line, deep lots with rear service alleys abutting the primary street or highway, or such other treatment as may be necessary as determined by the Planning Commission.
3. Where a development or subdivision borders on or contains a railroad right-of-way or limited access highway right-of-way, the Planning Commission may require a street approximately parallel to and on each side of such right-of-way, at a distance suitable for appropriate use of the intervening land. Such land would be appropriately used for park purposes in residential districts, or for commercial or industrial purposes in nonresidential districts. Such distances shall be determined with due regard for the requirements of approach grades and future grade separations.
4. Local streets shall be laid out to discourage through traffic.
5. All permanent dead-end streets, as opposed to temporary dead-end streets, shall be developed as cul-de-sacs in accordance with



the standards as set forth herein. Except where no other practical alternative is available, such streets may not extend more than six hundred (600) feet.

6. The minimum radius of the turnaround portion for a residential cul-de-sac, as measured to the flowline, shall be 40 feet, for all cul-de-sacs, regardless of lot size or cul-de-sac length. The minimum right-of-way shall be a 50-foot radius. Cul-de-sac bulbs shall be built with 4-inch mountable curb and gutter, with 5-foot wide attached sidewalk (See Standard Drawings). Commercial and Office development cul-de-sacs shall have minimum flowline radius of 45-feet and right-of-way radius of 60-feet and shall be constructed with 6-inch curb and gutter with detached sidewalk (See Standard Drawings).
7. Half streets (i.e. streets of less than full required right-of-way and pavement width) shall not be permitted, except where such streets, when combined with a similar street (developed previously or simultaneously) on property adjacent to the subdivision, creates or comprises a street that meets the right-of-way and pavement requirements as set forth herein.
8. Emergency vehicle access (EVA) may be required for portions of developments having only a single access.

i. Landscaping in Areas Between Curb and Sidewalk

The type of vegetation and landscaping to be planted within the area between the curb and sidewalk shall meet the minimum landscape standards of the *Superior Land Use Code* and shall depend on those particular utilities to be located underground in such areas. In general, planting of shallow rooted vegetation shall be encouraged to reduce adverse interaction between landscaping and any underground utilities and in the event that utilities must be repaired. The Town will maintain ultimate responsibility for maintenance of the area if located in the Public right-of-way. However, it would be expected that the individual property owners and/or Homeowner's Associations would carry out the standard day to day maintenance of these areas including mowing, trimming and weed removal, for example, where appropriate.





**TABLE 1.1 - ROADWAY CLASSIFICATIONS & REQUIREMENTS**  
(Refer to the Appendix for street sections)

Roadway Classification <sup>[1]</sup>	R.O.W. Width (feet) <sup>[2]</sup>	FL-FL Width	Travel Lanes	Recommended Median Width (feet) <sup>[3]</sup>	Posted Speed (MPH)	Parking
Alleys	16 <sup>[7]</sup>	12	1	---	---	----
Private	---	24	2	---	25	On-Street
Local	60 <sup>[6]</sup>	34 <sup>[5]</sup>	2	---	25	On-Street
Commercial/ Office	60 <sup>[6]</sup>	36 <sup>[5]</sup>	2	---	25-35	Optional
Minor Collector	60	36	2	---	30	No On-Street
Major Collector						
W/o median	90	62	4	---	35	No On-Street
With median	100	74 <sup>[4]</sup>	4	12 <sup>[4]</sup>	35	No On-Street
Minor Arterial	110	80	4	16	35 - 45	No On-Street
Major Arterial						
(4 - Lane)	120	80	4	16	45-50	No On-Street
(6-Lane)	130	104	6	16	45-50	No On-Street

**Notes:**

1. Final determination to be based on the projected traffic volumes in Table 1.2.
2. Easements for pedestrian walkways are included herein. Additional easements may be required per the utility entities (i.e., Xcel Energy, Qwest, etc.)
3. Medians in roadways are subject to final approval of the Town Engineer Metropolitan District.
4. Median optional, subject to Town approval. (Refer to typical sections in the Appendix).
5. Residential cul-de-sac flowline radius shall be a minimum of 40 feet. /Commercial and Office cul-de-sac flowline radius shall be a minimum of 45 feet.
6. Residential cul-de-sac ROW radius shall be a minimum of 50-feet. /Commercial and Office cul-de-sac radius shall be 60 feet.
7. R.O.W. may be required to be wider depending on utility requirements.



**TABLE 1.2**  
**ROADWAY CLASSIFICATION VERSUS VOLUME**

Street Classification	Lanes	Average Daily Traffic
Alley	1	N/A
Private	2	N/A
Local	2	Less than 2,000 VPD
Commercial/Office	2	Less than 8,000 VPD <sup>(1)</sup>
Minor Collector	2	2,000 – 8,000 VPD
Major Collector	4 Divided and Undivided	8,000 – 18,000 VPD
Minor Arterial	4 Divided	12,000 – 20,000 VPD
Major Arterial	4-6 Divided	20,000 – 40,000

**Notes:**

1. For Commercial/Office Streets with greater than 8,000 VPD, requirements for Major Collector Streets shall be used, subject to the Town Engineer's approval.

## **1.2.2 Roadway Classifications**

### **1.2.2.1 Alleys**

#### **a. Posted Speed Limit**

Speed Limit generally not posted. Design speed of 15 mph to be used for design purposes.

#### **b. Traffic Volumes**

Not Applicable, used only for dwelling access

#### **c. Continuity**

Limited continuity. Length to be determined on a site by site basis. Alleys may intersect with local and minor collector streets. Intersecting alleys and alleys with turns to be subject to the Town Engineer's approval. Setbacks for rear yard structures shall be a minimum of 8-feet from the property line.

#### **d. Safety**

Not Applicable



e. Traffic Control

Stop signs, yield signs, or right-of-way rules for uncontrolled intersections.

f. Function

Alleys provide direct access to adjacent property. Utility line easements should be available.

g. Right-of-Way/Easement

16-feet minimum right-of-way or easement required. Greater width may be necessary depending upon utility requirements and availability of turnouts. Any changes in right-of-way or easement width due to a change in street classification shall be made at intersections only. An appropriate radius of the right-of-way or easement will be provided at all intersections to ensure the sight distance triangle falls within the public right-of-way or easement.

h. Number of Moving Lanes

One.

i. Access Conditions

Intersections at grade with direct access to abutting property permitted.

j. Planning Characteristics

Alleys should be designed to discourage through traffic from moving through the neighborhood. Alleys may intersect with local and minor collector streets, but are not permitted to intersect with major collectors or arterial streets.

k. Type of Curb and Gutter

Concrete valley gutter required in center of alley for drainage (Refer to Standard Drawings).



l. Cul-De-Sacs/Knuckles/Bubbles

Not applicable.

m. Sidewalk Width

Not applicable.

n. Street Width

12-feet paved width (edge to edge pavement dimension) with concrete valley gutter along center of the alley.

o. Minimum Radius of Curvature on Centerline (Horizontal)

See Table 1.3.

p. Minimum Length of Vertical Curves

See Table 1.6.

q. Minimum Tangent Lengths

50-feet.

r. Street Grades

A minimum longitudinal grade of 1.0-percent shall be required on all alleys. Maximum grade 8.0-percent (See Table 1.6). Also, see Section 1.4, Drainage. In certain cases, grades less than 1.0-percent may be permitted with the Town Engineer's approval.

s. Curb Return Radii

See Table 1.4.

1.2.2.2 Private

a. Posted Speed Limit: 25mph

Speed Limit generally not posted. Design speed of 25 mph to be used for design purposes.



b. Traffic Volumes

Traffic volumes limited to access vehicles only.

c. Continuity

Limited continuity

d. Safety

Designed for the safety of pedestrians and bicyclists, and the ease of access to adjacent parcels of land. Private Streets are typically used by single users and no through traffic or parking is allowed.

e. Traffic Control

Stop signs, yield signs, or right-of-way rules for uncontrolled intersections.

f. Function

Private Streets provide direct access to adjacent property. No through traffic or parking is allowed. Utility line easements should be available.

g. Right-of-Way

Not Applicable.

h. Number of Moving Lanes

Two.

i. Access Conditions

Intersections at grade with direct access to abutting property permitted.

j. Planning Characteristics

Private Streets should be designed to discourage through traffic from moving through the neighborhood. Private Streets should not intersect minor collectors, major collectors or arterial streets.



k. Type of Curb and Gutter

6-inch curb gutter (optional depending on the application).

l. Cul-De-Sacs/Knuckles/Bubbles

Not applicable.

m. Sidewalk Width

5-foot wide detached sidewalk with a 4-foot grassed area between back of walk and face of curb (optional depending upon applications)

n. Street Width

Minimum 20-foot paved width plus 2-2 foot gutters, 24 feet flow-line to flowline depending on the development.

o. Minimum Radius of Curvature on Centerline (Horizontal)

See Table 1.3.

p. Minimum Length of Vertical Curves

See Table 1.6.

q. Minimum Tangent Lengths

50-feet.

r. Street Grades

A minimum longitudinal grade of 1.0-percent shall be required on all alleys. Maximum grade 8.0-percent (See Table 1.6). Also, see Section 1.4, Drainage. In certain cases, grades less than 1.0-percent may be permitted with the Town Engineer's approval.

s. Curb Return Radii

See Table 1.4.



### 1.2.2.3 Local

a. Posted Speed Limit: 25 mph

Posted or prima facie speeds for local street classifications shall be the same as the design speed of that street.

b. Traffic Volumes

Less than 2,000 vehicles per day.

c. Continuity

Limited continuity

d. Safety

Designed for the safety of pedestrians and bicyclists, and the ease of access to adjacent parcels of land. On-street parking is permitted.

e. Traffic Control

Stop signs, yield signs, or right-of-way rules for uncontrolled intersections.

f. Function

Local streets provide direct access to adjacent property. Traffic carried by local streets should have an origin or a destination within the neighborhood. Utility line easements should be available.

g. Right-of-Way

60 feet minimum right-of way required. Any change in R.O.W. width due to a change in street classification shall be made at intersections only. An appropriate radius of the R.O.W. will be provided at all intersections to ensure the sight distance triangle falls within the public R.O.W. A sight distance triangle will also be acceptable for the same purpose, (with the shorter dimension lying parallel to the centerline of the minor street). The minimum R.O.W. radius in a cul-de-sac, knuckle or bubble shall



be fifty (50) feet.

h. Number of Moving Lanes

Two.

i. Access Conditions

Intersections at grade with direct access to abutting property permitted.

j. Planning Characteristics

Local streets should be designed to discourage through traffic from moving through the neighborhood. Local streets should not intersect major collectors or arterial streets.

k. Type of Curb and Gutter

All local streets with the exception of cul-de-sac bulbs shall have 6-inch vertical-curb and gutter with 5-foot detached sidewalk. Cul-de-sac bulbs shall be constructed with 4-inch mountable curb and gutter with 5-foot wide attached sidewalk (See Standard Drawings).

l. Cul-De-Sacs/Knuckles/Bubbles

Cul-de-sacs, Knuckles and Bubbles, shall all have a minimum flowline radius of forty-five (40) feet and minimum right-of-way radius of fifty (50) feet (See Standard Drawings in the Appendix). Cul-de-sacs may have a maximum length of 600 feet or a maximum of 40 dwelling units (if approved by the Fire District), whichever is most restrictive. Cul-de-sacs longer than 600 feet, or with more than 25 dwelling units, may require all units to be sprinkled per NFPA-13D.

m. Sidewalk Width

5-foot wide sidewalk detached a minimum distance of 8 feet from the face of curb.





n. Street Width

30-feet paved width plus 2-2 foot gutter pans. (34 feet flowline to flowline). Cul-de-sacs shall have a minimum flowline radius of 40-feet.

o. Minimum Radius of Curvature on Centerline (Horizontal)

See Table 1.3

p. Minimum Length of Vertical Curves

See Table 1.6

q. Minimum Tangent Lengths

50 feet.

r. Street Grades

A minimum longitudinal flowline grade of 1.0-percent shall be required on all Local streets; except at curb returns, knuckles, and bubbles where the minimum flowline grade shall be 2.0 percent. Maximum grade 8.0-percent (See Table 1.6). Also, see Section 1.4, Drainage. In certain cases, grades less than 1.0-percent may be permitted with the Town Engineer's approval.

s. Curb Return Radii

See Table 1.4.

1.2.2.4 Commercial & Office

a. Posted Speed Limit – 25-35 mph

Posted or prima facie speeds for the various street classifications shall be 5 miles per hour less than the design speed of that street.

b. Traffic Volumes

Less than 8,000 vehicles per day. When volumes are projected to exceed 8,000 vehicles per day, streets shall be designed as Major Collector Streets and shall be subject to the Town Engineer's



approval. Painted or raised and landscaped or patterned concrete medians may be required.

c. Safety

Designed for the safety of pedestrians and bicyclists, and the ease of access to adjacent parcels of land. On-street parking may be permitted subject to the Town Engineer's approval.

d. Traffic Control

Stop signs, yield signs, or right-of-way rules for uncontrolled intersections.

e. Function

Commercial and Office Streets provide direct access to adjacent commercial and office properties. Traffic carried by commercial and office streets generally would have an origin or a destination within the neighborhood. Utility line easements should be available.

f. Right-Of-Way

60-feet. An appropriate radius for the R.O.W. will be provided at all intersections to ensure the sight distance triangle falls within the public R.O.W. and radii can accommodate appropriate, truck traffic in accordance with AASHTO turning templates. The minimum cul-de-sac, knuckle, and bubble R.O.W. radius shall be 60 feet.

g. Number of Moving Lanes

Two (2) moving lanes with left and right turn lanes as warranted.

h. Access Conditions

Intersections at grade with direct access to abutting properties permitted.

i. Planning Characteristics

Commercial/Office streets should be designed to accommodate



commercial vehicles and their circulation. Streets should not intersect arterial streets. No on-street parking, backing or loading maneuvers shall be allowed in the street without approval of the Town Engineer.

j. Type of Curb and Gutter

6-inch vertical curb & gutter with 5-foot detached walk, including cul-de-sac bulbs.

k. Cul-De-Sacs/Knuckles/Bubbles

Cul-de-sacs, Knuckles, and Bubbles shall have a minimum flowline radius of fifty (45) feet and a minimum R.O.W. radius of 60 feet (See Standard Drawings in Appendix) and shall be designed for appropriate truck traffic in accordance with AASHTO turning templates. Cul-de-sacs may have a maximum length of 600 feet. Cul-de-sacs longer than 600 feet will require Fire Department and Town approval and may require all units to be sprinkled per NFPA- I 3D.

l. Sidewalk Width

Minimum 5-foot width detached sidewalk, or wider, depending on pedestrian volumes Sidewalk shall be detached a minimum distance of 7-feet from the face of the curb. In special cases, sidewalk may be attached to the back of curb, with Town Board approval.

m. Street Widths

32 feet paved width plus 2-2 foot gutter pans (36 feet flowline to flowline). Twelve-foot wide left turn lanes may also be required as indicated by the traffic study or by other factors at the direction of the Town Engineer. Painted or raised and landscaped or patterned concrete medians may be required at the Town Engineer's discretion

n. Minimum Radius of Curvature on Centerline (Horizontal)

See Table 1.3



o. Minimum Length of Vertical Curves

See Table 1.6

p. Minimum Length of Tangents Between Curves

100 feet.

q. Street Grades

A minimum longitudinal flowline grade of 1.0-percent shall be required on all Local streets except at curb returns, knuckles, and bubbles where the minimum flowline grade shall be 2.0 percent. Maximum grade 6.0-percent (See Table 1.6). Also, see Section 1.4, Drainage. In certain cases, grades less than 1.0-percent may be permitted at the approval of the Town Engineer.

r. Curb Return Radii

See Table 1.4.

1.2.2.5 Minor Collector

a. Posted Speed Limit – 30 MPH

Posted or prima facie speeds shall be the same as the design speed.

b. Traffic Volumes

Greater than 2,000 vehicles per day, and less than 8,000 vehicles per day.

c. Continuity

Continuous for 0.25 to 0.50 mile.

d. Safety

Designed to handle traffic volumes loading from and onto local, other collector, and arterial roadways. No back-out drives are permitted.



e. Traffic Control

Regulation of traffic accomplished through the use of stop signs and channelization. Traffic signals normally used only at intersections with major collectors and arterial streets.

f. Function

Collector streets collect and distribute traffic between arterial and local streets, and serve as main connectors within communities, linking one neighborhood with another. Traffic carried by collector streets generally has an origin or a destination within the community. No back-out drives are permitted. On-Street Parking is not permitted. Minor Collector Streets shall be provided with a 5-foot wide bike lane in both directions. Utility line easements should be available.

g. Right-Of-Way

60-feet. An appropriate radius for the R.O.W. will be provided at all intersections to ensure the sight distance triangle falls within the public R.O.W.

h. Number of Moving Lanes

Two.

i. Access Conditions

Intersections at grade with no direct access to abutting property permitted unless no other access is reasonably available.

j. Planning Characteristics

Minor Collector streets should have continuity throughout a neighborhood but need not extend beyond the neighborhood.

k. Type of Curb and Gutter

6-inch vertical curb & gutter.



l. Sidewalk Width

Sidewalk shall be 5 feet wide and detached a minimum of 7 feet from the face of the curb.

m. Street Widths

32 foot-paved width plus 2-2 foot gutter pans. (36 foot flowline - flowline) forming two 11-foot drive lanes plus two 5-foot bike lanes plus two 2-foot gutters. Additional lanes may be required at intersections.

n. Minimum Radius of Curvature on Centerline (Horizontal)

See Table 1.3

o. Minimum Length of Vertical Curves

See Table 1.6

p. Minimum Length of Tangents Between Curves

100 feet.

q. Street Grades

A minimum longitudinal grade of 1.0-percent shall be required along the centerline of all Collector and Arterial streets. Maximum grade 6.0-percent (See Table 1.6). Also, see Section 1.4, Drainage. In certain cases, grades less than 1.0-percent may be permitted with the approval of the Town Engineer

r. Curb Return Radii

See Table 1.4.

1.2.2.6 Major Collector

A major collector is a general term denoting a roadway with painted or raised median, designated or operating with the following characteristics:



a. Posted Speed Limit -35 MPH

Posted or prima facie speeds for the various street classifications shall be 5 miles per hour less than the design speed of that street.

b. Traffic Volumes

Generally greater than 8,000 vehicles per day and less than 18,000 vehicles per day.

c. Continuity

Continuous for 0.5 to 2.0 miles

d. Safety

Designed to handle traffic volumes loading from and onto local, other collector, and arterial roadways. No back-out drives are permitted.

e. Traffic Control

1. Regulation of traffic accomplished through the use of traffic signs, signals and channelization.
2. Parking is prohibited.
3. Traffic signals will normally be located only at intersections with streets of higher classification.

f. Function

Major collector streets permit relatively unimpeded traffic movement and are intended for use on those routes where four (4) moving lanes are required but where a larger classified street is not warranted. No back-out drives are permitted. On-Street Parking is prohibited. Bike Lanes are to be provided in each direction.

g. Right-Of-Way

90-feet (minimum without median) 100-feet (with median). An appropriate radius for the R.O.W. will be provided at all intersections to ensure the sight distance triangle falls within the public R.O.W.



**h. Number of Moving Lanes**

Four moving lanes with painted or raised curb and gutter median, and left and right turn lanes, as required.

**i. Access Conditions**

1. Intersections-at grade.
2. Access from street of lower classification will be permitted but in all cases will be controlled by traffic control devices.
3. Direct access to abutting property is not permitted unless no other access is reasonably available.
4. Full movement intersections with other collector and arterial streets should be at least 600 feet.

**j. Planning Characteristics**

1. Major collector streets should be employed where traffic demands dictate.
2. Landscaping elements are encouraged (Trees, open space, etc.).

**k. Type of Curb and Gutter**

6-inch vertical curb & gutter. 6-inch median curb and gutter as required.

**l. Sidewalk Width**

5-feet wide detached. Sidewalk shall be detached a minimum of 7-feet from the face of the curb for either a Major Collector with median or without median (See Standard Drawings in Appendix)

**m. Street Widths**

1. Major Collector without Median Option: 4-12ft. paved lanes, two 5-foot bike lanes, with 2-2ft. gutter pans (62-foot flowline-flowline).
2. Major Collector with Median Option: 1-11ft. and 1-12ft. paved lane in each direction, two 5-ft. bike lanes with 2-





2ft. gutter pans, 2-1ft. median gutters; 1-12ft. median/center turn lane (74ft. flowline - flowline)

n. Minimum Radius of Curvature on Centerline (Horizontal)

See Table 1.3

o. Minimum Length of Vertical Curves

See Table 1.6

p. Minimum Length of Tangents Between All Curves

One hundred feet.

q. Street Grades

A minimum longitudinal grade of 1.0-percent shall be required along the centerline of all Collector and Arterial streets. Maximum grade 6.0-percent. (See Table 1.6). Also, see Section 1.4, Drainage. In certain cases, grades less than 1.0-percent may be permitted with the Town Engineer's approval.

r. Curb Return Radii

See Table 1.4.

1.2.2.7 Minor Arterial

a. Posted Speed Limit - 35-45 MPH

Actual posted speed to be determined by the Town Engineer prior to submittal of construction plans. Posted or prima facie speeds shall be 10 miles per hour less than the design speed of that street.

b. Traffic Volumes

Generally greater than 12,000 vehicles per day and less than 20,000 vehicles per day.



c. Continuity

Continuous, 2.0 to 6.0 miles.

d. Safety

Designed to handle traffic volumes loading from and onto collector, and arterial roadways.

e. Traffic Control

1. Regulation of traffic accomplished through the use of traffic signs, signals and channelization.
2. Parking is prohibited.
3. Traffic signals will normally be required at major intersections.

f. Function

Arterial routes permit relatively unimpeded traffic movement and are intended for use on these routes where four moving lanes and one left-turn lane are required but where a major arterial cross section would not be warranted. Bike Lanes are to be provided in each direction.

g. Right-Of-Way

110-feet (minimum). Additional R.O.W. may be required based on future transit needs as identified by the Town Engineer and/or the Planning Department.

h. Number of Moving Lanes

Four (4) moving lanes.

i. Access Conditions

1. Intersections at grade.
2. Access from street of lower classification will be permitted, but in all cases will be controlled by traffic control devices.
3. Direct access to abutting property is not permitted unless no other access is reasonably available.



j. Planning Characteristics

1. Arterials should be spaced from one half (1/2) to one (1) mile apart and, where possible, should be continuous.
2. Arterials should act as boundaries between neighborhood areas.
3. Full Intersection spacing shall be 1/4 mile.

k. Type of Curb and Gutter

6-inch vertical curb & gutter with 6-inch vertical median curb and gutter.

l. Sidewalk Width

5-feet wide detached. Sidewalk shall be detached a minimum distance of 9-feet back from the face of the curb.

m. Street Widths

4-12ft. paved travel lanes (minimum); 1-16ft. raised median; 2-5ft. bike lanes, 2-2ft. gutter pans and 2-1ft. median gutter pans. (80ft. flowline-flowline). Left and right turn lanes; acceleration and deceleration lanes required at intersections, as necessary.

n. Minimum Radius of Curvature on Centerline (Horizontal)

See Table 1.3

o. Minimum Length of Vertical Curves

See Table 1.6

p. Minimum Length of Tangents Between All Curves

250 feet.

q. Street Grades

A minimum longitudinal grade of 1.0-percent shall be required



along the centerline of all Collector and Arterial streets. Maximum grade 6.0-percent (See Table 1.6). Also, see Section 1.4, Drainage. In certain cases, grades less than 1.0-percent may be permitted with the Town Engineer's approval.

r. Curb Return Radii

See Table 1.4.

1.2.2.8 Major Arterial (4 Lane)

a. Posted Speed Limit – 45-50 MPH

Actual posted speed to be determined by the Town Engineer prior to submittal of construction plans. Posted or prima facie speeds for the various street classifications shall be 10 miles per hour less than the design speed of that street.

b. Traffic Volumes

Generally greater than 20,000 vehicles per day, and less than 40,000 vehicles per day.

c. Continuity

Continuous, generally connecting with regional routes.

d. Safety

Major arterial streets permit rapid and relatively unimpeded traffic movement throughout the Town, connecting major land use elements as well as communities with one another. Designed to handle traffic volumes loading from and onto collector, and arterial roadways.

e. Traffic Control

1. Regulation of traffic accomplished through the use of traffic signals and channelization.
2. Parking shall be prohibited.
3. Roadways should have a raised median strip between them.



f. Function

Major arterial routes permit rapid and relatively unimpeded traffic movement throughout the region, connecting major land use elements, as well as communities with one another. Bike Lanes in each direction shall be provided.

g. Right-of-Way

120-foot ROW is the minimum requirement. Additional R.O.W. may be required based on future transit needs as identified by the Planning Department.

h. Number of Moving Lanes

Four (4) moving lanes

i. Access Conditions

1. Intersections at grade.
2. Full movement Intersections will normally be located at 1/4 mile intervals.
3. Access from collector and arterial streets shall be controlled by traffic control devices.
4. Normally, direct access to abutting property is not permitted.
5. Abutting properties should not face onto the roadway unless separated from it by a frontage road.

j. Planning Characteristics

Major arterials should be spaced approximately one (1) mile apart and should traverse an entire region. Major arterial streets should not bisect neighborhoods, but should act as boundaries between them.

k. Type of Curb and Gutter

6-inch vertical curb & gutter with 6-inch vertical median curb and gutter.



l. Sidewalk Width

5feet-wide detached. A minimum distance of 9 feet from the face of the curb to the nearest edge of the sidewalk is required.

m. Street Widths

4-12ft. travel lanes (minimum); 1-16ft. median, raised median with 2-1ft. median gutters and 2-2ft. gutter pans. Right turn lanes and left-turn-lanes, acceleration and deceleration lanes required at intersections (80ft. flowline-flowline, minimum).

n. Minimum Radius of Curvature on Centerline (Horizontal)

See Table 1.3

o. Minimum Length of Vertical Curves

See Table 1.6

p. Minimum Length of Tangents Between All Curves

Three hundred feet.

q. Street Grades

A minimum longitudinal grade of 1.0-percent shall be required along the centerline of all Collector and Arterial streets. Maximum grade 6.0-percent. See Table 1.6. Also, see Section 1.4, Drainage. In certain cases, grades less than 1.0-percent may be permitted with the Town Engineer's approval.

r. Curb Return Radii

See Table 1.4.

1.2.2.9 Major Arterial (6 Lane)

a. Posted Speed Limit – 45-50 MPH

Actual posted speed to be determined by the Town Engineer prior to submittal of construction plans. Posted or prima facie speeds for the various street classifications shall be 10 miles per hour



less than the design speed of that street.

b. Traffic Volumes

Generally greater than 40,000 vehicles per day.

c. Continuity

Continuous, generally connecting with regional routes.

d. Safety

Major arterial streets permit rapid and relatively unimpeded traffic movement throughout the region, connecting major land use elements as well as communities with one another. Designed to handle traffic volumes loading from and onto collector, and arterial roadways.

e. Traffic Control

1. Regulation of traffic accomplished through the use of traffic signals and channelization.
2. Parking shall be prohibited.
3. Roadways should have a raised median with curb and gutter between them.

f. Function

Major arterial routes permit rapid and relatively unimpeded traffic movement throughout the region, connecting major land use elements, as well as communities with one another. Bike Lanes shall be provided in each direction.

g. Right-Of-Way

130-feet (minimum). Additional R.O.W. may be required based on future transit needs as identified by the Town Engineer and/or the Town Planning Department.

h. Number of Moving Lanes

Six (6) moving lanes



i. Access Conditions

1. Intersections will generally be at grade.
2. Full movement intersections will normally be located at 1/4-mile intervals.
3. Access from collector and arterial streets shall be controlled by traffic control devices.
4. Normally, direct access to abutting property is not permitted.
5. Abutting properties should not face on the roadway unless separated from it by a frontage road.

j. Planning Characteristics

Major arterials should be spaced approximately one (1) mile apart and should traverse an entire city and/or county. Major arterial streets should not bisect neighborhoods but should act as boundaries between them.

k. Type of Curb and Gutter

6-inch vertical curb & gutter with 6-inch vertical median curb and gutter.

l. Sidewalk Width

5 feet wide detached. The nearest edge of the detached walk shall be a minimum of 9 feet from the face of the curb.

m. Street Widths

6-12ft. travel lanes (minimum); 1-16ft. raised median 2-2ft. gutter pans; 2-1ft. median gutters; plus necessary turn lanes, acceleration/deceleration lanes (104ft. flowline-flowline minimum).

n. Minimum Radius of Curvature on Centerline (Horizontal)

See Table 1.3.

o. Minimum Length of Vertical Curves

See Table 1.6.





p. Minimum Length of Tangents Between All Curves

Three hundred feet.

q. Street Grades

A minimum longitudinal grade of 1.0-percent shall be required along the centerline of all Collector and Arterial streets. Maximum grade 6.0-percent (See Table 1.6). Also, see Section 1.4, Drainage. In certain cases, grades less than 1.0-percent may be permitted with the Town Engineer's approval.

r. Curb Return Radii

Table 1.4.

1.2.3 Location of Utilities

Water, storm drain, and sanitary sewer utilities shall be located within the streets in accordance with the dimensions, locations and details as set forth in the Standard Drawings in the Appendix. It is important to make every effort to try to meet these requirements to maintain consistency in placement and location of all utilities within the Town of Superior.

1.3 SIDEWALKS, BICYCLE LANES, CURBS, GUTTERS, AND DRIVEWAYS

1.3.1 Roadway typical sections shall be as specified by these Roadway Standards and the *AASHTO Bicycle Manual*.

1.3.2 The sidewalks required by this section shall be constructed in accordance with the Town's Specifications, except that the Town may permit the installation of walkways constructed with other suitable materials when it has been concluded that:

1. Such sidewalks would serve the residents of the development as adequately as concrete sidewalks; and
2. Such walkways would be more environmentally desirable or more in keeping with the overall design of the development

1.3.3 Whenever the Town finds that a means of pedestrian access is necessary from the subdivision to schools, parks, playgrounds or other roads or facilities, and that such access is conveniently provided by sidewalks adjacent to the streets,



the developer may be required to reserve an unobstructed easement of at least thirty (30) feet in width to provide access.

- 1.3.4 All public sidewalks shall be constructed to a minimum thickness of six (6) inches from four thousand (4,000) psi concrete. Private sidewalks may be constructed to a minimum thickness of four (4) inches. This does not apply to sidewalks that are to become the property of an HOA, in which case public standards shall apply.
- 1.3.5 Sidewalks or bicycle paths shall be constructed on both sides of all roadways as directed by the Town Engineer and in accordance with the *Town of Superior Comprehensive Plan*.
- 1.3.6 Where "on-street" bicycle lanes are shown on the *Town of Superior Comprehensive Plan* an additional five (5) feet of street width and right-of-way shall be added in addition to the requirements of these Sections, to accommodate the bicycle lane.
- 1.3.7 Off-Street bikeways shall have right-of-way reserved and dedicated in accordance with Section 1.17.
- 1.3.8 All sidewalks shall have a minimum width of five (5) feet for local, commercial, collector and arterial streets.
- 1.3.9 Vertical curb, gutter and detached walk shall be used on all roadways.
- 1.3.10 State law requires that handicap ramps be installed at all intersections and at certain mid-block locations, for all new construction or reconstruction of curb and sidewalk (CRS 43-2-107[2]). Handicap ramps shall be constructed in accordance with the Standard Drawings herein and if required in accordance with the Standard Details found in the *CDOT M-Standards and Specifications*. Handicap ramps shall be shown at all curb returns, and must be shown (located) at all "T" intersections directly opposite either curb return. Whenever referencing a handicap ramp call out the specific Standard Detail to be used to construct that ramp. On local streets only, mid-block handicap ramps should be constructed per the Standard Drawings and if required in accordance with the *CDOT M-Standard for Mid-Block Handicap Ramps*.
- 1.3.11 In general, all parking spaces serviced by the driveway will require radius returns.
- 1.3.12 Where curb cuts are allowed based on traffic considerations, concentrated storm water runoff must not be discharged across the sidewalk. These flows must be



directed to a sidewalk chase section (See Section 1.4). If this is not possible due to grading restraints, radius returns and a crossspan must be used.

1.3.13 Curb cuts and driveways shall be constructed in accordance with the Standard Drawings in the Appendix of these Regulations.

1.3.14 On all Town major collectors and arterials, wherever desirable, underpass or overpass (grade separated) pedestrian crossings will be provided for regional/neighborhood trails.

1.3.15 The provision of a bicycle circulation system must be considered in all developments. Walks or combination sidewalk/bicycle lanes, which serve both pedestrians and bicyclists, shall be at least ten (10) feet wide.

1.3.16 Pedestrian routes must occur along streets and extend into major accessible open space areas. Pedestrian and bicycle circulation within each parcel shall tie into the larger community systems.

1.3.17 Sidewalks may be eliminated along one or both sides of major streets if adequate provisions are made for alternative pedestrian circulation-ways.

1.3.18 Bicycle parking areas must be provided for all commercial, office and industrial developments. Bicycle parking areas should be located near building entries, but should not encroach into Pedestrian walkways.

## 1.4 DRAINAGE

The minor and major storm drainage systems are designed in accordance with the *Superior Metropolitan District (SMD) No. 1 Stormwater Regulations*. Because safe and efficient conveyance of traffic is the primary function of roadways, the storm drainage function of the roadway, (such as allowable gutter capacity and street overtopping), will be designed to the limits set forth in the SMD Storm Drainage Criteria Manual. In the case of a conflict caused by requirements of the *SMD Storm Drainage Criteria Manual*, the stricter drainage requirements will govern.

### 1.4.1 Curb Drains

Due to the occurrence of subgrade soils with moderate to high swell potential, throughout the Town, continuous perforated pipe drains shall be installed directly behind the curbs of all roadways constructed within the Town of Superior. The purpose of the pipe drains is to intercept seepage water that may otherwise seep into the subgrade. All curb drain piping shall be constructed in accordance with the Standard Drawings as set forth in the Appendix. Curb



drainpipes shall be outletted into the nearest stormwater manhole approximately for every 500-feet of roadway section. All piping behind the curb shall be minimum 4-inch diameter Schedule 40, perforated PVC piping behind the curb and Schedule 40 non-perforated pipe within the roadway. Equivalent oval PVC pipe is acceptable. The type of PVC pipe joints used will require written approval of the Town Engineer, prior to commencing with the pipe's installation.

#### 1.4.2 Crosspans

Crosspans shall be constructed in accordance with the Standard Drawings in the Appendix of these Regulations. Crosspans are not permitted across entry streets, collector roadways, or arterial roadways but may occur parallel to these streets across a local street intersection.

If pavement is concrete, any drainage conveyance, such as crosspans, may be poured monolithically with the main line paving process.

On a case-by-case basis, if an excessive length of storm sewer must be constructed to comply with this requirement, causing undue financial hardship, a variance may be requested to use a 10-foot wide crossspan across a local street, an entry street, or a minor collector roadway. If there is storm sewer in the street, and within a reasonable distance, no crosspans shall be allowed.

No mid-block crosspans will be permitted within the Town of Superior, under any circumstances.

#### 1.4.3 Inlets

Inlets shall be located to intercept the curb flow at the point curb flow capacity is exceeded by the storm runoff. Refer to *SMD No. 1 Stormwater Regulations* for determining curb capacity. Inlets shall also be installed to intercept cross-pavement flows at points of transition in superelevation. Inlets are not allowed in the curb return, but will be located at or behind the tangent points of the curb returns. Minimum inlet length for Type R inlets shall be five (5) feet. Inlets shall not be permitted within the curb return but only at the tangent points of the returns, due to the presence of handicap ramps.

#### 1.4.4 Cross Slope

Except at intersections, or where superelevation is required, roadways shall be level from top of curb to top of curb (or flowline to flowline) and shall have a two (2) percent crown. At or within the "L" distance shown in Figure 1.1, the



maximum elevation difference between flowlines is that dictated by the allowable intersection grade and the actual distance between flowlines.

1.4.4.1 Parabolic or curved crowns are not permitted. In no case shall the pavement cross slope at warped intersections exceed the grade of the through street.

1.4.4.2 The rate of change in pavement cross slope, when warping side streets at intersections, shall not exceed one (1) percent every twenty-five (25) feet horizontally on a local roadway, one (1) percent every thirty-seven and one-half (37.5) feet horizontally on a collector roadway, or one (1) percent every fifty-six and one-half (56.5) feet horizontally on arterial roadways (See *Section 1.7*).

#### 1.4.5 Temporary Erosion Control

Temporary erosion control is required along and at the ends of all roadways that are not completed due to project phasing, subdivision boundaries, etc., in accordance with *SMD Stormwater Regulations* and standard practice for erosion control utilized throughout the Denver Region.

#### 1.4.6 Sidewalk Chases

Storm water from concentrated points of discharge shall not be allowed to flow over sidewalks, but shall drain to the roadway by use of chase sections. Sidewalk chase sections shall not be located within the curb cut or driveway. Hydraulic design shall be in accordance with *SMD Stormwater Regulations*. Sidewalk chases will only be allowed in special situations, on a case-by-case basis, as determined by the Engineer. Sidewalk chases, when permitted, are to be used to allow surface drainage to enter into the street gutter, rather than being used to avoid the use of a standard inlet.

All drainage structures shall be constructed in accordance with Details included in the Appendix.

### 1.5 HORIZONTAL ALIGNMENT

#### 1.5.1 Horizontal Curves

Horizontal Curves shall be designed in accordance with Table 1.3 as follows:



**TABLE 1.3  
HORIZONTAL CURVES**

DESIGN SPEED (MPH)	Max f	MINIMUM CURVE RADIUS* (FEET)
15	0.330	45
20	0.300	90
25	0.252	165
30	0.221	275
35	0.197	415
40	0.178	600
45	0.163	830

\*Adapted from AASHTO Exhibit 3-41 for the no superelevation case.

### 1.5.2 Curb Return Radii

Minimum curb return radius dimensions are presented in Table 1.4.

**TABLE 1.4  
MINIMUM CURB RETURN RADII  
(Measured Along Flowline)**

THROUGH STREET	ARTERIAL	COLLECTOR	LOCAL	COMMERCIAL AND INDUSTRIAL
ALLEYS/ PRIVATE	N/A	N/A	15ft.	N/A
LOCAL	35ft.	25ft.	20ft.	40ft.
COMMERCIAL AND INDUSTRIAL	40ft.	40ft.	40ft.	40ft.
COLLECTOR	35ft.	25ft.	25ft.	40ft.
ARTERIAL	50ft.	35ft.	35ft.	40ft.

### 1.5.3 Design Speed

Horizontal alignment design speed shall be consistent with the requirement for vertical alignment design speed.

If no superelevation is required and a normal crown section exists, the



horizontal curve data as shown in Table 1.3 shall be used.

#### 1.5.4 Barricades

Whenever roadways terminate due to project phasing, subdivision boundaries, etc., barricades shall be provided. Design and construction shall comply with the requirements of the most current edition of *The Manual of Uniform Traffic Control Devices* most recent edition and all CDOT Standards and Details shall be shown on the construction drawings, and installation shall be provided and maintained by the Developer.

#### 1.5.5 Superelevation

Superelevation may be required for curves on arterial roadways and selected collector roadways. Horizontal curve radii and superelevation shall be in accordance with the recommendations of the AASHTO "Green Book", (Horizontal Alignment).

Superelevation shall not be used on local or other roadway classifications with a design speed of 50 mph or less. Superelevation shall not be used without prior approval by the Town Engineer.

##### 1.5.5.1 Definitions Regarding Superelevation

Superelevation Runoff: That length of roadway needed to accomplish the change in cross slope from a section with the adverse crown removed (flat) to the fully superelevated section, or vice versa.

Transition Points: Beginning or ending of tangent runout, superelevation runoff or full superelevation.

Tangent Runout: That length of roadway needed to accomplish the change in cross slope from a normal (2.0-percent) crown section to a section with the adverse crown removed (flat), or vice versa.

##### 1.5.5.2 General

One of the most important factors to consider in highway safety is the centrifugal force generated when a vehicle traverses a curve. Centrifugal force increases as the velocity of the vehicle and/or the degree of curvature increases.

It is impossible to balance centrifugal force by superelevation alone,



because for any given curve radius a certain superelevation rate is exactly correct for only one driving speed. At all other speeds there will be a side thrust either outward or inward, relative to the curve center, which must be offset by side friction.

#### 1.5.5.3 Standards for Superelevation

The *CDOT Division "M" Standards* on Superelevation specify the required rate of superelevation for the various degrees of curvature.

Maximum superelevation rates of 0.04 to 0.06 foot per foot are commonly used on major streets. The lower value should be used where snow and ice are significant factors.

#### 1.5.5.4 Urban Street Conditions

Every effort should be made to maintain standard rates of superelevation. However, in urban areas, street intersections, established street grades, curbs and drainage conditions may require a reduction in the rate of superelevation, or different rates for each half of the roadbed. In warping areas for drainage, adverse superelevations should be avoided.

#### 1.5.5.5 Effect of Grade

Drivers tend to travel somewhat faster in the downgrade than in the upgrade direction. This should be recognized in the designs for divided highways and ramps on steep grades.

Where practical, the designer should use a higher design speed for the downgrade and a lower design speed for the upgrade. The variation of design speed will depend upon the rate and length of grade and the degree of curvature compared with other curves on the highway section.

### 1.5.6 Cul-de-sacs

Criteria for cul-de-sacs shall be in accordance with the requirements of Section 1.2.





## **1.5.7 Sight Distances**

### **1.5.7.1 General**

The major considerations in alignment design are safety, grade, profile, road area, design, speed, sight distance, topography, drainage and performance of heavy-duty vehicles. Alignment should provide for safe and continuous operation at a uniform design speed. Road layout shall bear a logical relationship to existing, or platted roads in adjacent properties.

### **1.5.7.2 Horizontal Alignment**

- a. **Sight Distance**: Horizontal alignment must provide at least the minimum stopping distance for the design speed at all points. This includes visibility at intersections as well as around curves and roadside encroachments.
- b. **Stopping Sight Distance**: The minimum stopping sight distance is the distance required by the driver of a vehicle traveling at the design speed to bring the vehicle to a stop after an object on the road becomes visible. Object height is typically assumed to be 2.0-feet above the road surface with the viewer's height is 3.50 ft. above road surface. All Stopping Sight Distances shall be evaluated in accordance with the AASHTO "Green Book" including along horizontal curves

Typical sight distance obstructions include fences, abutments, trees, structures, sideslopes, etc. In no case shall the stopping sight distance be less than the distances specified in Table 1.5. The sight distance design procedure shall assume a 6ft.-0-inch fence (as measured from actual finished grade) exists at all property lines except in the sight-distance triangles required at all intersections.



**TABLE 1.5**  
**STOPPING AND PASSING SIGHT DISTANCE**

DESIGN SPEED (MPH)	STOPPING SIGHT DISTANCE (FT)	PASSING SIGHT DISTANCE (FT)
20	115	710
25	155	900
30	200	1,090
35	250	1,280
40	305	1,470
45	360	1,625
50	400	1,835
55	450	1,985

From AASHTO 2001 "Green Book" Exhibits 3-1 and 3-7 and represent minimum distances only.

c. Passing Sight Distance: Passing sight-distance is the minimum sight distance that must be available to enable the driver of one vehicle to pass another safely and comfortably without interfering with oncoming traffic traveling at the design speed. Two-lane roads should provide adequate passing zones. Minimum required passing sight distances for specified design speeds are given in Table 1.5

d. Intersection and Driveway Sight Distance (Sight Triangle): There shall be an unobstructed sight distance along both approaches of both sides at an intersection within the R.O.W. for distances sufficient to allow the operators of vehicles, approaching simultaneously, to see each other in time to prevent collisions at the intersection. The sight triangle relationship developed for use in the Town is based upon the dimensions shown in Figure 1.2 for a stopped condition.

Any object within the sight triangle more than thirty-six (36) inches above the flowline elevation of the adjacent street shall constitute a sight obstruction, and shall be removed or lowered. Such objects include: buildings, cut slopes, hedges, trees, bushes, utility cabinets or tall crops. This design criteria also requires the elimination of parking (except on local streets) within the sight triangle and applies whether the intersecting roads are level or on grades. The sight distance shall be measured to the centerline of the closest through lane in both directions.



## 1.6 VERTICAL ALIGNMENT

Vertical alignment sight distances as with horizontal alignment shall be evaluated in accordance with the AASHTO "Green Book". Both the horizontal and vertical sight distances should be checked to insure that the sight distance along the major highway is sufficient to allow a vehicle to cross or turn left, whichever is required. Design controls for vertical alignment are given in Table 1.6.

TABLE 1.6  
VERTICAL ALIGNMENT CONTROLS

DESCRIPTION	DESIGN SPEED	MAX/(MIN) GRADE ALONG CENTER - LINE (%)	K-VALUE RANGES		MIN V.C.L.	
			CREST	SAG	CRES T	SAG
LOCAL/PRIVATE	25	8 (1)	25-30	25-30	50	50
ALLEYS	15	8 (1)	25-30	25-30	50	50
COMMERCIAL / OFFICE	25	6 (1)	35-50	35-50	50	50
MINOR COLLECTOR	30	6 (1)	35-50	40-50	50	50
MAJOR COLLECTOR	35	6 (1)	55-65	55-65	50	50
MINOR ARTERIAL	35-45	6 (1)	70-105	65-85	70	60
MAJOR ARTERIAL	45-50	6 (1)	115-220	90-125	110	90

Notes:

1. The design speed is equal to the posted speed for local streets. For Commercial, Office and Collector Streets, the design speed is considered a minimum of five (5) mph over the posted speed for all roads. The design speed of arterials is considered to be ten (10) mph over posted and design speeds are minimum for arterials.
2. In certain, cases grades less than the minimum grade specified in Table 1.6, may be permissible with the approval of the Town Engineer.
3. All vertical curves in knuckles and bubbles shall have minimum lengths of 50 feet.

### 1.6.1 Permissible Roadway Grades

A minimum longitudinal flowline grade of 1.0-percent shall be required on all Local streets, except at curb returns, knuckles, and bubbles where the minimum flowline grade shall be 2.0-percent.

A minimum longitudinal grade of 1.0-percent shall be required along the



centerline of all Collector and Arterial streets unless otherwise approved by the Engineer.

The maximum allowable grade for any roadway is shown in Table 1.6 of these Regulations.

The maximum sideslopes in either excavated earth or earthfill will be 3 to 1, unless otherwise approved. The maximum permissible cut slopes in rock are 2 to 1 unless otherwise approved.

### **1.6.2 Permissible Intersection Grades (Public Rights-of Way)**

The maximum permissible grade at intersections will be in accordance with Figure 1.1. These grades are Maximum instantaneous flowline grades for the stated distances (each side of the street) for the minor (intersecting) street. Desirable intersection grades should be in the range of two (2.0) to four (4.0) percent for all intersecting streets with the limit of three (3.0) percent for arterials.

The intersection grade of the major (through) street at the intersection may be dictated by design considerations for that street. The Town will dictate however, if the major street intersection grade exceeds 3-percent, the type of access and access control.

All private commercial driveways with curb return radii shall follow the standard set forth for a local street. The length of the maximum grade for the commercial driveway shall be a minimum of 50 feet measured from the flowline intersection of the public roadway.

All vertical curves in knuckles and bubbles shall have minimum lengths of 50 feet.

### **1.6.3 Changing Grades**

The use of grade breaks in lieu of vertical curves is discouraged. However, if a grade break is necessary and the algebraic difference in grade is less than or equal to eight-tenths of one percent (0.008ft./ft.) along the roadway, a grade break will be permitted.

The maximum grade break allowed at the point of tangency at a curb return for local and collector roads shall be two (2.0) percent and for arterial roadways a maximum of one (1.0) percent.



#### 1.6.4 Cross Fall

Except at intersections, or where superelevation is required, roadways shall be level from top of curb to top of curb (or flowline to flowline). The distance from intersections with which "cross-fall" will be permitted shall be determined by criteria in Section 1.4.4, Cross-Slope.

#### 1.6.5 Vertical Curves

When the algebraic difference in grade exceeds eight tenths of one percent (0.008 ft./ft.), a vertical curve is to be used. Vertical Curve design criteria is presented in Table 1.6. All vertical curves shall be labeled, in the profile, with length of curve (L), and K. The high point and low point elevations and stations shall also be labeled on the profile.

All vertical curves in knuckles and bubbles shall have minimum lengths of 50 feet.

### 1.7 INTERSECTIONS

The following criteria shall apply at intersections:

- 1.7.1 The grade of the "through" street shall take precedence at intersections. At intersections of roadways with the same classification, the more important roadway, as determined by the Town Engineer, shall have this precedence. The design should warp side streets to match through streets with as short a transition as possible.
- 1.7.2 The key criteria for determining the elevation of the curb return on the side street and the amount of warp needed on a side street transitioning to a through street are:
  - a. Permissible grade in the stop/start lane (See Section 1.6.2).
  - b. Pavement cross slope at the points of curvature (PCR's) of the curb returns on the side street, and permissible warp in pavement cross slope (See Section 1.4.4).
  - c. Normal vertical curve criteria (See Section 1.6.5).
  - d. Vertical controls within the curb return itself (See Section 1.7.3).



- 1.7.3 The elevation at the PCR of the curb return on the through street is generally set by the grade of the through street in conjunction with normal pavement cross slope (2.0-percent).
- 1.7.4 Carrying the crown at a side street into the through street is permitted only when drainage considerations warrant such a design. Refer to Section 1.4.4.2 for street cross slope allowances.
- 1.7.5 Dipping the flowline to the extent that the lip of gutter is dipped is not permitted. Dipping the flowline is only permitted as specified by Standard Details concerning curb opening inlets. Tipping an inlet for the benefit of drainage is not permitted.
- 1.7.6 A more detailed review shall be performed for arterial-arterial intersections to maximize driveability. Few arterial intersections will have a uniform 2-percent cross slope, the majority of them having one or more sides warped. (See Sections 1.4.4 and 1.7.2 of this Chapter for rates of pavement warp allowed).
- 1.7.7 Whenever possible, intersections shall be made at right angles or radial to a curve. Intersections, that cannot meet this criterion, will require approval by the Town Administrator. Under no circumstances will any streets be permitted that intersect at angles less than eighty (80°) degrees.
- 1.7.8 Intersection sight distances shall conform to the requirements of the AASHTO Green Book (2001), or the most recent addition.
- 1.7.9 No more than two (2) streets shall intersect at one point.
- 1.7.10 Grades of Intersecting streets shall be as set forth in Figure 1.1 for the specified distance given in the table, unless otherwise approved by the Town Engineer.
- 1.7.11 The intersection of local streets with major collector streets shall be minimized. Whenever possible, proposed intersections along one (1) side of the street shall coincide with existing or proposed intersections on the opposite side of such street. In any event, where a centerline offset or jog occurs, at an intersection, the distances between centerlines of the intersecting streets shall not be less than one hundred fifty feet. Roads with medians are exempted from this requirement.
- 1.7.12 Unless no other alternative is practicable or legally possible, no two (2) streets may intersect with any other street on the same side at a distance of less than three hundred (300) feet measured from centerline to centerline of the intersecting streets. When the intersected street is an arterial, the distance



between the intersecting streets shall be six hundred (600) feet. This does not apply to residential streets.

1.7.13 The minimum fall around curb returns, along the flowline shall be 2-percent.

## 1.8 CURB RETURN PROFILES

Curb return profiles are required for radii equal to or greater than thirty (30) feet within the public right-of-way. A midpoint elevation along the arc length of the curb return shall be shown in plan view for all radii less than 30 feet. Curb return design shall be set in accordance with the following design procedure. General standards for flowline control and profiles within the curb returns shall be as follows:

- 1.8.1 The point of tangency at each curb return shall be determined by the projected tangent grade beginning at the point of intersection (P.I.) of the flowlines.
- 1.8.2 The arc length and external distance of the curb return shall be computed and indicated on the drawing.
- 1.8.3 Show the corresponding flowline (or top of curb) grade for each roadway beyond the PCR.
- 1.8.4 Design the flowline of the curb return such that the maximum slope along the flowline does not exceed eight (8) percent. Grade breaks at the PCR's will not exceed two (2) percent for local and collector streets and one (1) percent for arterials. Maximum vertical curves will equal the arc length of the curb return. The elevation and location of the high or low point within the return, if applicable, is to be called out in the profile. Warp of the side streets shall match across the street within the "L" distance shown on Figure 1.1. No more than a 1 foot vertical difference in elevation across the street at the PCR is allowed.
- 1.8.5 Scale for the curb return profile is 1-inch = 10-feet horizontally and 1-inch = 1-feet vertically.
- 1.8.6 Curb return radii, existing and proposed, shall be shown.

## 1.9 CONNECTION WITH EXISTING ROADWAYS

- 1.9.1 Connection with existing roadways shall be smooth transitions conforming to normal vertical curve criteria (See Section 1.6) if the algebraic difference in grade (A) between the existing and proposed grade exceeds one (0.008 ft./ft.) percent. When a vertical curve is used to make this transition, it shall be fully completed prior to the connection with the existing improvement, and shall also



comply with the grade requirements at intersection approaches.

- 1.9.2 Existing grade shall be shown for at least three hundred (300) feet with field verified record drawings showing stations and elevations at twenty-five (25) foot intervals. In the case of connection with an existing intersection, these record drawings are to be shown within a three hundred (300) foot radius of the intersection. This information will be included in the plan and profile those shows that proposed roadway.
- 1.9.3 Limits and characteristics of the existing improvements are the primary concern in the plan view. Such characteristics include horizontal alignment, off-site intersections, limits of the improvement, etc.
- 1.9.4 Previously approved designs for the existing improvement are not an acceptable means of establishing existing grades, however, they are to be referenced on the construction plan, where they occur.
- 1.9.5 The basis of the as-built elevations shall be the same as the design elevations (both flowlines or both top or curbs, etc.) when possible. All elevations shall be based on USGS or other datum approved by the Town Engineer.

## 1.10 OFF-SITE DESIGN

The design grade, and existing ground at that design grade, of all roadways that dead end due to project phasing, subdivision boundaries, etc., shall be continued, in the same plan and profile as the proposed design, for at least five hundred (500) feet or to its intersection with an arterial roadway. This limit shall be extended to one thousand (1,000) feet when arterial roadways are being designed.

- 1.10.1 If the off-site roadway, adjacent to the proposed development is not fully improved, the developer is responsible for the design and construction of a transition for the safe conveyance of traffic from his improved section to the existing roadway. The following formula shall be applied to the taper of lane change necessary for this transition:

$$L = WS^2/60$$

Where:

- L = Length of transition in feet
- W = Width of offset in feet
- S = Speed limit or 85th percentile speed.

- 1.10.2 The Town Engineer should be contacted to approve unusual transition criteria.





This contact is the responsibility of the applicant.

### 1.11 ACCELERATION/DECELERATION LANES

The design of the arterial street system depends upon the proper control of access to developments. The location and design of access points must minimize traffic hazards and interference to through traffic movements. Acceleration/Deceleration lanes shall be designed in accordance with the most recent edition of the *State of Colorado, State Highway Access Code*, appropriate Sections of the *CDOT Road Design Manual* and applicable *CDOT Standards*. The need for acceleration or deceleration lanes shall be established by the approved traffic impact study for the final plat or final development plan.

### 1.12 BUS PULLOUT LANES

If recommended by the Regional Transportation District, bus pullout lanes shall be designed and constructed by the adjacent Developer.

1.12.1 The design of the pullout lanes will be governed by dimensions shown in Table 1.7 and shall be reviewed and approved according to procedures set forth in these Regulations.

TABLE 1.7  
BUS PULLOUT LANES

SPEED LIMIT	LEAD-IN LENGTH	LEAD-OUT LENGTH
35 MPH & UNDER	60ft.	60ft.
40 MPH	100ft.	70ft.
45 MPH	150ft.	80ft.
50 MPH	200ft.	90ft.
55 MPH	250ft.	100ft.

1.12.2 Bus pullouts shall be constructed with no less than 50 feet between an intersection curb return curve (PCR) and end of the lead-in taper.

### 1.13 CONSTRUCTION TRAFFIC CONTROL

#### 1.13.1 Pedestrian Traffic

Every precaution shall be taken to ensure that construction work does not interfere with the movement of pedestrian traffic, which shall be maintained on



the sidewalk at all times. Flagmen shall be provided for guidance as necessary.

- 1.13.1.2 Where an excavation interrupts the continuity of the sidewalk, the contractor shall provide suitable bridge or deck facilities, to be supplemented by the use of such proper devices and measures as prescribed in the *Manual of Uniform Traffic Control Devices* most recent edition, for the safe and uninterrupted movement of pedestrian traffic. The edges or ends of the pedestrian bridge or decking shall be beveled or chamfered to a thin edge to prevent tripping.
- 1.13.1.3 Temporary diversion walkways shall be hard surfaced and electric lighting shall be provided and kept continuously burning during hours of darkness, unless otherwise directed by the Town Engineer.
- 1.13.1.4 Unless otherwise authorized by the Town Engineer, pedestrians shall not be placed in the position of having to walk on a traveled portion of a roadway.
- 1.13.1.5 Under certain conditions, it may be necessary to divert pedestrians to the sidewalk on the opposite side of the street. Such crossings shall only be made at intersections or at marked pedestrian crossovers, with the Town Engineer's approval.
- 1.13.1.6 Facilities satisfactory to the Town Engineer shall be provided for pedestrians crossing at corners, pedestrian crossovers and public transportation stops.

#### 1.13.2 Vehicular Traffic

- 1.13.2.1 Construction work zone traffic shall be controlled by signs, barricades, detours, etc., which are designed and installed in accordance with the most recent edition of *The Manual of Uniform Traffic Control Devices*, and applicable Town Traffic Regulations. A Traffic control plan shall be submitted and accepted by the Town Engineer or his designate prior to the start of any construction.
- 1.13.2.2 During construction of new facilities, traffic control should strive to keep the motorist from entering the work area. The primary means to accomplish this are by use of temporary barricades, located in advance of the point where new construction joins existing and by appropriate signing. New construction shall not be opened to traffic, or construction traffic control removed, without the approval of the Town Engineer.



- 1.13.2.3 In general terms, a construction traffic control plan must be drawn on a map. The traffic control plan should be superimposed on record drawings, construction plan drawings, or other detailed maps.
- 1.13.2.4 The *Manual on Uniform Traffic Control Devices* shall be the basis upon which the construction traffic control plan is designed, in concert with proper, prudent, and safe engineering practice. All necessary signing, striping, channelization devices, barricading flagging, etc. shall be shown on the plan.
- 1.13.2.5 In concept, Town streets shall not be closed overnight, and work shall not force road or lane closures before 8:30 a.m. or after 3:30 p.m. If exceptions to this are required, this shall be so noted on the construction traffic control plan and must be specifically approved by the Town Engineer.
- 1.13.2.6 Directional access on roadways may be restricted (minimum travel lane width in construction area is 10 feet), but proper controls including flagging must be indicated. Removal of on-street parking should be considered, and noted where applicable.

## 1.14 MEDIAN ISLANDS

- 1.14.1 Median islands shall be designed per the Standard Drawings as set forth herein.
- 1.14.2 The nose of the median island shall not extend past the curb return at the intersection.
- 1.14.3 Landscaping on median islands shall have a mature height of 24 inches or less above the traveled way in areas around intersections to facilitate adequate sight distance and will preferably be dry land or native vegetation. If irrigation is planned for a median island, mitigation will be provided to protect the subgrade under the pavement from being saturated by using the median island detailed in the Standard Drawings in the Appendix.
- 1.14.4 A minimum flowline-flowline dimension of 20 feet must be maintained on both sides of all median islands. Refer to Roadway Section Details in *Appendix I* for required flowline-flowline dimensions for specific roadway classifications.
- 1.14.5 When median islands are constructed/designed for concrete streets and the island is hardscape, the Developer shall install twice the thickness of the expansion material on each side of the median between the back of curb and "hardscape" and seal the expansion material.



1.14.6 Median islands 4 feet wide or less may not be landscaped and must be designed as stamped or patterned concrete. All median materials, including colors, shall be approved by the Town Engineer to ensure uniformity of construction throughout the Town.

## 1.15 SIGNAGE AND STRIPING CRITERIA

Because the Town will maintain the permanent traffic control devices on public rights-of-way, all traffic control devices shall be fabricated and installed in accordance with these Regulations. A signage and striping plan and detail sheet, approved by the Town Engineer, shall be included in all sets of construction plans.

Permanent signage and striping shall be completely in place before any new roadway is opened to the public. These standards are to be used in conjunction with other applicable Town Regulations.

Traffic signal installation and equipment shall conform to *Construction Methodology and Materials* as set forth by CDOT. All signals, signs and other traffic control devices shall be installed in accordance with the most current edition of *The Manual on Uniform Traffic Control Devices (MUTCD)*. Signal Warrants shall be met for signal installation.

### 1.15.1 Reflectivity

All traffic control devices and all regulatory signs must have reflective materials. All reflective materials must qualify at 70-candlepower (E.G.) or above (High Intensity). All signs, or traffic control devices, must have a seven-year materials warranty. Red regulatory signs must be High intensity grade reflectivity or greater; in particular, all STOP, YIELD, or DO NOT ENTER signs.

### 1.15.2 Design and Size

Sign specifications and diagrams are detailed in the *MUTCD* and the Federal "Standard Highway Signs." (Publication available from the U.S. Department of Transportation, Federal Highway Administration, 1979.) Acceptable sign sizes are listed in the standard column of the table printed with each diagram. Expressway and construction signs will be a minimum 36 inches. STOP signs used at major roadway intersections shall be a minimum 36 inches.

### 1.15.3 Backing Plates

Aluminum blanks of .080 gauge is standard, except for signs larger than 36 x 36



inches, which shall be .100 or .125 gauge aluminum.

#### **1.15.4 Posts and Boots**

- 1.15.4.1** Signs shall be mounted on 2.25-inch x 2.25-inch square galvanized steel tubing, all four sides punched with 3/8-inch holes at one inch (1-inch) centers. Refer to Standard Drawings in *Appendix I* of these Regulations. Posts must be of appropriate length to pass the MUTCD specifications for the location, must conform to CDOT specification Section 614, and must meet the Federal breakaway standards. Installation boots are to be two and one-fourth inch by three feet (2 ¼-inch x 3-feet) four (4) punch tubing, driven down flush to within 1-inch of ground level.
- 1.15.4.2** Sign boots are to be driven a minimum of three feet (3ft.) into the ground, and longer boots may be required because of soil composition and compaction.
- 1.15.4.3** The height to the bottom of the sign assembly shall be at least eight feet (8ft.) above the adjacent roadway crown, when installed exclusively for street name posting. When combined with traffic control (STOP or YIELD) signs, the street name sign assembly shall be at least nine feet (9ft.) above the adjacent roadway crown.
- 1.15.4.4** Post caps and crosses shall have five-inch by one-fourth inch (5-inch x ¼-inch) slots for plates.
- 1.15.4.5** Street name assembly should be located at point of curvature of corner radius and should be placed according to the requirements as stated in 1.14.5 (Street Name Signs) of these Regulations. When street name assembly is combined with regulatory signs, sign placement for the regulatory sign shall govern.

#### **1.15.5 Street Names, Addresses and Signs**

Street names shall be assigned by the developer and are subject to the Town's approval. Proposed streets that are in obvious alignment with existing streets shall be given the same name. Newly created streets shall be given names that neither duplicate nor are phonetically similar to existing streets within the Town's planning jurisdiction, regardless of the use of different suffixes.

- 1.15.5.1** Building Addresses shall be assigned and/or approved by the Town.



1.15.5.2 Six-inch plates, up to 30 inches long, may be used at all minor intersections, minimum two plates per street sign assembly. Nine-inch plates shall be used at all major intersections. All 9-inch by 3/16-inch and 6-inch by 30-inch plates will be installed, two for each road, minimum four plates per street sign assembly and shall be installed with end bolts on all plates. In the instance where a street changes names, such name changes should be designated on the street name assembly by using directional arrows and will require two additional plates.

1.15.5.3 Street name assembly should be located at the point of curvature of the corner radius and should be placed according to the following, as measured from the edge of the sign. When the street name assembly is combined with regulatory signs, sign placement for the regulatory sign shall govern.

Curb, Gutter and Sidewalk Combination:

Two feet behind sidewalk

Curb with no Sidewalk or Detached Sidewalk:

Two to five feet behind curb on local streets. On collector streets, 4 to 6 feet behind curb, and on arterials, 6 to 8 feet behind curb.

No Curb or Gutter:

Six to twelve feet from edge of pavement.

Gravel Road:

Six to eighteen feet from edge of travel lane and outside of ditch.

1.15.5.4 The height to the bottom of the sign assembly shall be at least eight feet above the adjacent roadway crown, when installed exclusively for street name posting. When combined with traffic control (STOP or YIELD) signs, the street name sign assembly shall be at least nine feet above the adjacent roadway crown.

1.15.5.5 Sign assemblies shall be installed on standard 1-3/4-inch, four (4) punch square tubing, (3/8-inch diameter holes on one inch centers, galvanized), or mounted on available utility poles with suitable hardware, when required lateral clearance can be achieved.

1.15.5.6 When street name sign assemblies are posted with the traffic control, posts must be standard 2-inch tubing, using 2 1/4-inch x 3-foot boots



driven until flush with the grade. For exclusive street name installations, standard 1-3/4-inch tubing with 2-inch x 3-foot boots may be used.

1.15.5.7 Sign boots are to be driven a minimum of three feet into the ground. Longer boots may be required because of soil composition and compaction.

1.15.5.8 Post caps and crosses shall be 5 inch x 1/4-inch slots for plates.

1.15.5.9 All street signs will be high intensity white on reflectorized green. Lettering shall be Series C.

#### 1.15.6 Criteria on Special Allowances for Street Name Sign Variations

1.15.6.1 Plans for any variances must be submitted to and reviewed by the Town Engineer. List all specific variances from the Town Regulations in the special footnote box on the first page of the plans.

1.15.6.2 All street name signage size and reflectivity (red may not be used as background color) shall meet or exceed Town standards.

#### 1.15.7 Consultant Engineer's Responsibility

These requirements for signage are intended for typical applications of signage and striping for standard conditions. These Regulations do not alleviate the responsibility of the Consultant Engineer from exercising sound engineering judgment or from exceeding minimum standards in specific cases where conditions warrant.

#### 1.15.8 Striping

1.15.8.1 All new striping on newly constructed streets shall meet the minimum standards for thermoplastic or epoxy applications.

1.15.8.2 All striping shall be in compliance with most current editions of the *MUTCD*.

1.15.8.3 All temporary striping shall conform to the most current edition of "*Standard Specifications for Road and Bridge Construction*" published by the Colorado Department of Transportation. All temporary markings shall be removed prior to the installation of the thermoplastic.



1.15.8.4 All stop bars shall be white and a minimum of 12-inches wide. All centerline striping shall be yellow and 4-inches wide. All raised crosswalk striping shall be white and a minimum of 8-inches wide.

1.15.8.5 All striping shall be shown along with signing on the roadway plans of the construction plans or on a separate sheet if the roadway design is for a collector or arterial roadway.

## 1.16 FIRE LANES

Any secondary access not constructed as part of the dedicated public street system shall meet the following design criteria in addition to the roadway design criteria within these Regulations. Fire lanes shall be required when safe access to structures within a Project is limited. The requirement for fire lanes shall be determined in the PRELIMINARY PLAT process by the Fire Department and/or Planning Department.

## 1.17 REQUIRED RIGHT-OF-WAY DESIGNATION

1.17.1 At the time of final plat approval, the developer must dedicate to the Town the rights-of way required in these Sections along with all streets, alleys, walks, open space and easements shown on the plat, unless there are exceptions specifically noted on the plat. The dedicated rights-of-way will be shown on the final plat along with the dedication endorsement. Such dedication may be required to be made to the appropriate special district, or as required otherwise by the Town, with reversion clauses to the Town included.

1.17.2 Where trails or bikeways are shown on the *Town of Superior Comprehensive Plan* as crossing a parcel proposed for development, the developer shall work with the Town to establish an alignment through the parcel and dedicate this alignment to the Town. In general, the width for trail or bikeway dedication shall be thirty (30) feet, if not associated with a street, unless otherwise approved by the Town. Areas dedicated for trails or bikeways may be included in the open space requirements of the development.

## 1.18 BRIDGES

All Bridges shall be constructed in accordance with the most recent edition of the *CDOT Standards and Specifications for Roadway and Bridge Construction*, except that bridges on streets not intended for public dedication may be approved, if designed by a licensed engineer.





## 1.19 TRAFFIC CALMING

Traffic calming involves changes in street alignments, installation of barriers, and other physical measures to reduce traffic speeds and/or cut-through volumes, in the interest of street safety, livability, and other public purposes. It is the combination of physical measures that reduce the negative effects of motor vehicle use, alter driver behavior, and improve conditions for non-motorized street users.

What is a safe and livable street? Many studies have shown that residents are more satisfied with the street environment when traffic volume speeds are low to moderate. Tolerable limits appear to be less than 800 vehicles per day and top speeds of 20 mph.

The Town of Superior's street standards recognize the need to balance safety, efficiency of service, livability and economy. A hierarchy of street classifications has been established, with the higher classification (major and minor arterials and major collectors) designed to carry higher volumes and higher speeds and the lower classifications (minor collector and local streets) designed primarily to provide land access with expected lower volumes and lower speeds. Clearly, traffic calming measures would not be appropriate on arterials or major collectors. Minor collectors or local streets should be designed with traffic calming in mind. In identifying streets that may be candidates for traffic calming measures, traffic volume and unimpeded street length should be considered. Unimpeded street length is the distance between speed impediments, i.e. Stop signs, traffic signals, sharp turns, cul-de-sacs, etc. Streets that generally will require implementation of traffic calming measures are listed in Table 1.8 along with minimum criteria to qualify for Traffic Calming.

TABLE 1.8  
MINIMUM CRITERIA FOR TRAFFIC CALMING

Classification	Unimpeded Street Length	Traffic Volume
Local Street	> 1,200 feet	< 500 vpd
Local Street	> 900 feet	500 - 2,000 vpd
Minor Collector	> 900 feet	> 2,000 vpd

vpd = vehicles per day

There are many types of traffic calming measures that could be used on streets predicted to have higher than desired speeds or traffic volumes. The Institute of Transportation Engineers (ITE) has published several reports describing traffic calming

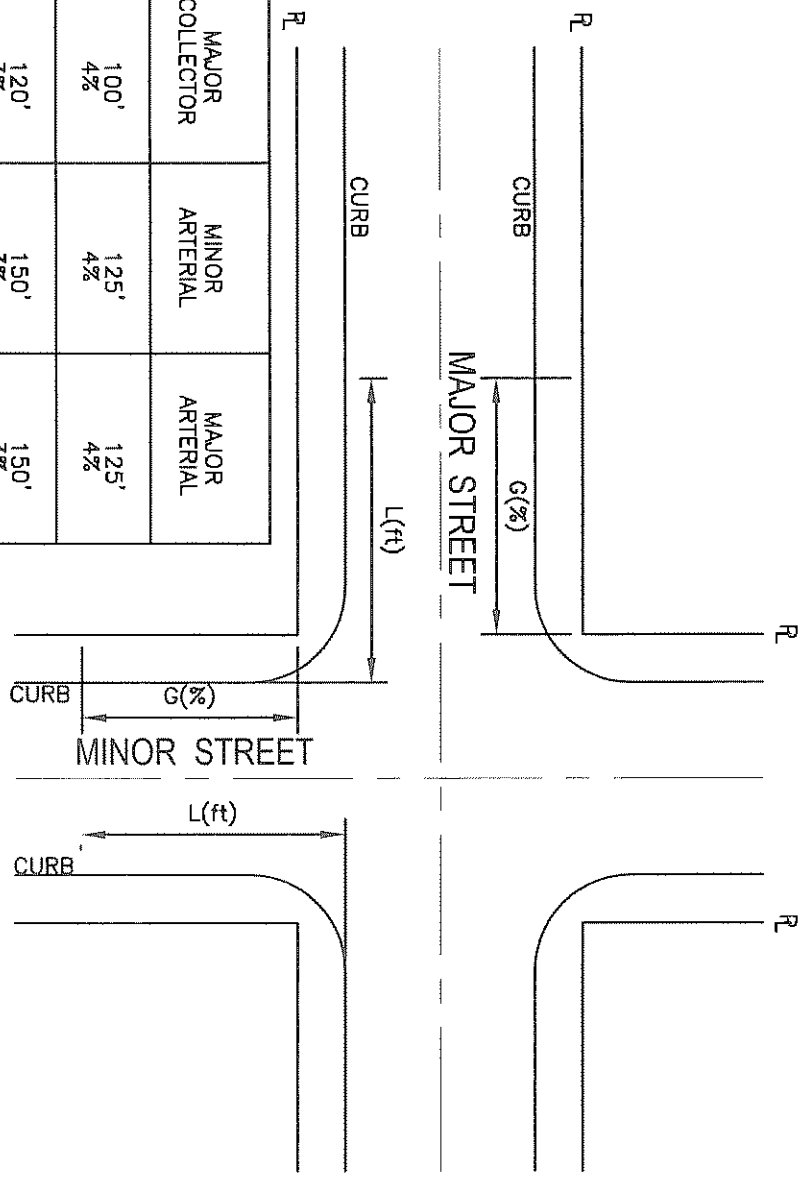


measures and then effectiveness, including:

- *Transportation Planning Handbook*, 1999, Chapter 17
- *Traffic Engineering Handbook*, 1999, Chapter 9
- *Traffic Calming: State of the Practice*, 1998

These resources should be consulted to identify and design appropriate traffic calming measures applicable for new developments. In general, vertical elements such as speed bumps and humps should be avoided while horizontal elements such as roadway narrowing, medians, bulbouts and traffic circles, etc. should be used.





MINOR STREET \ MAJOR STREET	LOCAL	MINOR COLLECTOR	MAJOR COLLECTOR	MINOR ARTERIAL	MAJOR ARTERIAL
LOCAL	95' 4%	100' 4%	100' 4%	125' 4%	125' 4%
MINOR COLLECTOR	—	100' 4%	120' 3%	150' 3%	150' 3%
MAJOR COLLECTOR	—	—	120' 3%	150' 3%	200' 3%
MINOR ARTERIAL	—	—	—	200' 2%	200' 2%
MAJOR ARTERIAL	—	—	—	—	200' 2%

THE LONGITUDINAL SLOPE OF THE MAJOR STREET SHALL CONTINUE THROUGH THE INTERSECTION AND MAY BE GREATER THAN THE MAX. "G" SHOWN IN THE TABLE EXCEPT AT MAJOR COLLECTORS AND ARTERIALS.

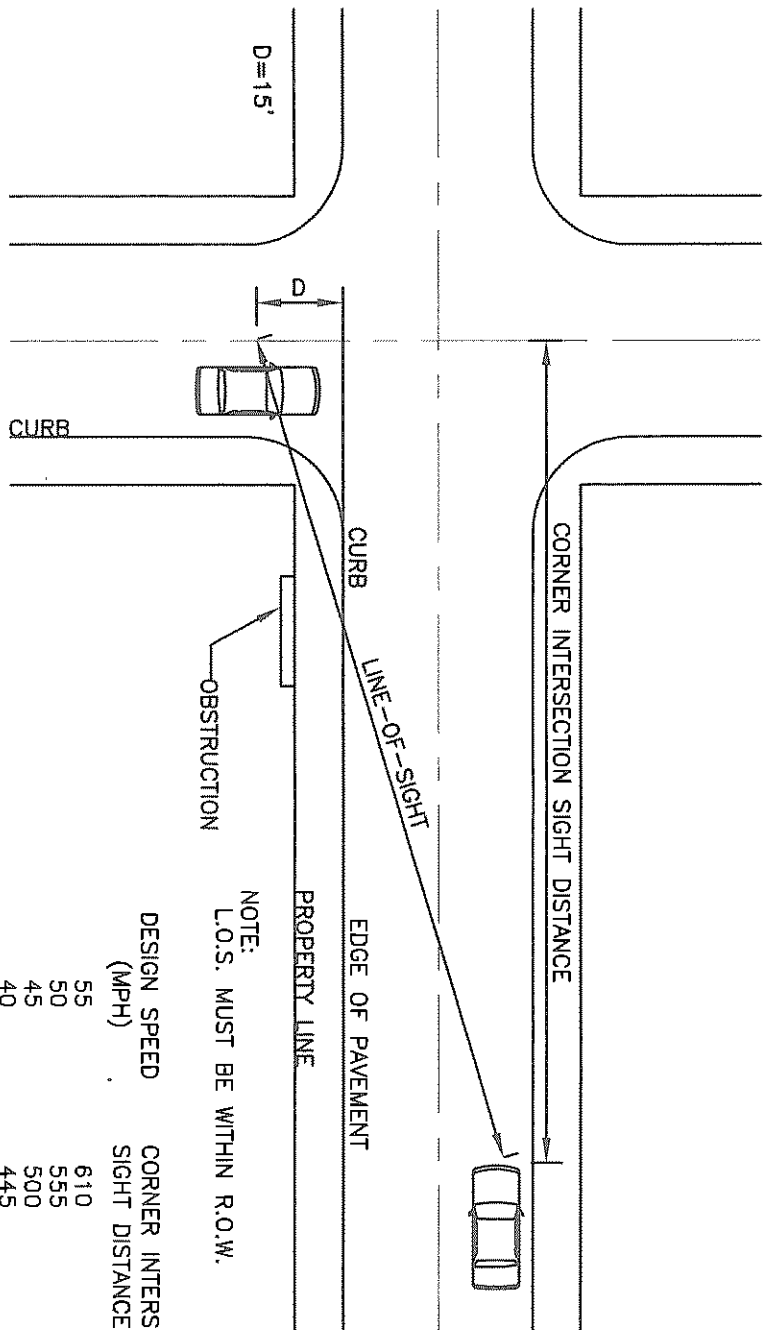


# ROADWAY DESIGN STANDARDS

## PERMISSIBLE INTERSECTION GRADES AND LENGTHS

FIGURE

1.1



**DESIGN INTERSECTION SIGHT DISTANCE  
(LEFT TURN FROM STOP)**

DESIGN SPEED (MPH)	CORNER INTERSECTION SIGHT DISTANCE (FT.)*
55	610
50	555
45	500
40	445
35	390
30	335***
25	280***
20	225***

- \* CORNER SIGHT DISTANCE MEASURED FROM A POINT ON THE MINOR ROAD AT 15 FEET BACK FROM THE EDGE OF THE MAJOR ROAD PAVEMENT (FLOWLINE) AND MEASURED FROM A HEIGHT OF EYE AT 3.50 FEET ON THE MINOR ROAD TO A HEIGHT OF OBJECT AT 3.50 FEET ON THE MAJOR ROAD.
- \*\*\* AT LOCAL-LOCAL STREET INTERSECTIONS ONLY, THE "D" DISTANCE SHALL BE TEN FEET (10') AND THE SIGHT DISTANCE SHALL BE MEASURED TO THE CENTERLINE OF THE STREET.
- \*\*\*\* FOR PRIVATE DRIVEWAY ACCESS TO A PUBLIC STREET, USE 10 FEET BACK FROM FLOWLINE (OR SHOULDER FOR GRAVEL ROADS).

(AFTER EXHIBIT TABLE 9-55 AASHTO GREEN BOOK 2001)



ROADWAY DESIGN STANDARDS  
INTERSECTION SIGHT DISTANCE  
REQUIREMENTS

FIGURE

1.2

# CHAPTER 2

## ACCESS REQUIREMENTS AND CRITERIA

## TABLE OF CONTENTS

Section	Title	Page
2.1	General .....	2.1
2.2	Criteria for Access Onto Town Roadways .....	2.1
2.3	Basic Principles for Curb Openings and Driveways .....	2.5
2.4	Definition of Terms .....	2.7
2.5	General Requirements .....	2.8
2.6	Control Dimensions .....	2.9
2.7	Unpermitted Access .....	2.11

# TOWN OF SUPERIOR

## CHAPTER 2 ACCESS REQUIREMENTS AND CRITERIA

### 2.1 GENERAL

Access to Town streets and roadways are approved through one of two mechanisms: (1) For new developments, access is granted through Town Board approval on the final plat; (2) To obtain access from existing developed property to Town streets, the mechanism is dependent on the zoning:

- a. For Planned Developments, new or altered access must be obtained through the Town's Platting Process. This involves applying through the Planning Department to create or amend the property's final development plan. The PD application should be accompanied by appropriate plans for the proposed access and technical justification, including justification for the extent of improvements proposed at the access point.
- b. For straight-zoned property, application for access can be made using the Town's Permit Application procedure. This application should be accompanied by plans of the proposed access and technical justification for the access and associated public improvements.

The Engineering Division staff is available to provide advice on the extent of technical justification required for any access request. It is recommended that this advice be sought prior to submitting any application.

All residential permits shall be issued through the Town's Public Works Division. The Public Works Division will continue to review all commercial and industrial access (Site Plans) and State Highway access requests.

### 2.2 CRITERIA FOR ACCESS ONTO TOWN ROADWAYS

#### 2.2.1 State Highways

Access to State Highways is governed by the State Highway Access Code.

#### 2.2.2 Major Arterials

All new freeway access in the Town shall meet the requirements of the Colorado Department of Transportation and the Denver Regional Council of



## Governments.

**2.2.2.1** An Access Permit must be obtained from the Town for any private access constructed to a major arterial. In general, the Town will require an Access Management Plan to be developed and approved for all arterials.

**2.2.2.2** Generally, no private direct access shall be allowed onto a major arterial, unless a signal progression plan has been approved. Private direct access to major arterials may be permitted only when the property in question has no other reasonable access to the general street system, or when denial of direct access to the major arterial and alternative direct access to another roadway would cause unacceptable traffic operation and safety problems to the overall traffic flow of the general street system. When private access must be provided, the following shall be considered:

- a. Such access shall continue only until such time that some other reasonable access to a lower function category street is available and permitted. The Access Permit should specify the future reasonable access location(s), if known, and under what circumstances, what changes will be required.
- b. No more than one access shall be provided to an individual parcel, or to contiguous parcels, under the same ownership, unless it can be shown that: (1) allowing only one access conflicts with safety regulations, (e.g., fire access); or (2) additional access would significantly benefit safety and operation of the highway or street and is necessary to the safe and efficient use of the property.
- c. An access shall be limited to right turns only, unless: (1) it has the potential for signalization; (2) left turns would not create unreasonable congestion or safety problems and lower the level of service; and (3) alternatives to the left turns would not cause unacceptable traffic operation and safety problems to the general street system.

**2.2.2.3** Public direct access to a major arterial, where left turns are to be permitted, must meet the signal spacing criteria following. Those that do not meet these requirements shall be limited to right turns only, unless they meet the requirements of 2.2.2.2.c above. No local streets shall be permitted to intersect major arterials.





#### **2.2.2.4 Spacing and Signalization Criteria**

- a. In general terms, full access to major arterials shall be limited to one-half mile intervals, plus or minus approximately 200 feet, in order to achieve good speed, capacity, and optional signal progression. However, to provide flexibility for both existing and future conditions, an approved engineering analysis of signal progression shall be made to properly locate any proposed access that may require signalization.

#### **2.2.3 Minor Arterials**

**2.2.3.1** An Access Permit must be obtained from the Town for any private access constructed to a minor arterial.

**2.2.3.2** Generally, no private direct access shall be allowed onto a minor arterial. Private direct access onto a minor arterial may be permitted if it:

- a. Does not have the potential for signalization, as per the requirements of Sections 2.2.2.2.b and 2.2.2.2.c above.
- b. Does have the potential for signalization, if it meets the signal spacing requirements for intersecting public streets stated below, and does not interfere with the location, planning, and operation of the general street system and access to nearby properties.

**2.2.3.3** Public direct access to a minor arterial, where left turns are to be permitted, must meet the signal spacing criteria following. Those that do not meet these requirements shall be limited to right turns only, unless they meet the requirements of Section 2.2.3.2.c above. No local streets shall be permitted to intersect minor arterials.

#### **2.2.3.4 Spacing and Signalization Criteria**

- a. In general terms, full access to minor arterials shall be limited to one-quarter mile intervals, plus or minus approximately 100 feet, in order to achieve good speed, capacity, and optional signal progression.
- b. However, to provide flexibility for both existing and future conditions, an approved engineering analysis of signal



progression shall be made to properly locate any proposed access that may require signalization.

## **2.2.4 Major and Minor Collectors**

2.2.4.1 Private access to collectors shall be governed by the curb opening and driveway criteria following. Single family residence access to collectors is not permitted, unless access to a lower function category street is not available.

2.2.4.2 Public streets shall intersect minor collectors not closer than 330 feet from each other, (centerline to centerline), and shall intersect major collectors not closer than 660 feet from each other, (centerline to centerline). On minor collectors, the closest local street Intersection to an arterial shall be 330 feet from the arterial, (R.O.W. line of arterial to centerline of local street), and on major collectors shall be 660 feet from the arterial, (R.O.W. line of arterial to centerline of local street). On minor collectors with an ultimate projected traffic volume of less than 2,500 V.P.D., intersection spacing may be 250 feet, (centerline to centerline), (for first intersection from an arterial; 210 feet centerline to R.O.W. of arterial).

## **2.2.5 Local Streets**

2.2.5.1 Private access to local streets shall be governed by the curb opening and driveway criteria following.

2.2.5.2 Public streets should not intersect local roadways closer than 150 feet from each other, (centerline to centerline). On a local street, the closest intersection to a collector street shall be at least 210 feet, (centerline to centerline), and to an arterial street, the closest intersection shall be 210 feet, (arterial R.O.W. line to local street centerline).

When entry streets are used, the closest local street to an arterial shall be 160 feet (centerline of local street to R.O.W. of arterial); the closest local street to a minor collector shall be 160 feet (centerline to centerline); and the closest street to a major collector shall be 180 feet (centerline to centerline).

**GENERAL INFORMATION:** The closest local street intersection to an arterial, (measured from the arterial R.O.W. to the local street centerline), along a:



MAJOR COLLECTOR	660 feet
MINOR COLLECTOR	330 feet
MINOR COLLECTOR < 2500VPD	210 feet
ENTRY STREET	160 feet

## 2.3 BASIC PRINCIPLES FOR CURB OPENINGS AND DRIVEWAYS

2.3.1 Certain control values for curb openings and driveways require minimum dimensions in some instances and maximum values for other dimensions. The design of curb openings and driveways within the range of these dimensions will provide for good service on the part of the motorist using the driveway, while at the same time minimizing the interference to the traffic using the street. By controlling the location and width of openings or driveways along the street, it will be possible to avoid or eliminate long, open stretches where motorists can indiscriminately drive onto the street. The width of opening established in these Regulations is based on studies which indicate that the various width openings will accommodate vehicles of maximum size authorized on Town streets and highways. In case of conflict between requirements in the various sections of this chapter, the more restrictive condition will normally apply.

2.3.2 The opening or driveway width should be adequate to handle properly the anticipated traffic volume and character of traffic, as well as being within the limits specified for the type of property development. The controls established for curb openings and driveways shall apply to existing streets as well as new streets that may be developed in the future.

2.3.3 To the greatest extent possible, all openings for driveways shall be located at the point of optimum sight distance along the street. For openings and driveways to commercial establishments and service stations, there shall be sufficient space reasonably cleared of any obstructions, such that drivers entering the property will give sufficient sight distance to enable them to make proper and safe movements. The profile of a driveway approach and the grading of the adjacent area shall be such that when a vehicle is located on the driveway outside the traveled portion of the street, the driver can see a sufficient distance in both directions so as to enable him to enter the street without creating a hazardous traffic situation. The driveway profile grade within public R.O.W. shall not exceed four (4%) percent.

2.3.4 Any adjustments which must be made to utility poles, street light standards, fire hydrants, catch basins or intakes, traffic signs and signals, or other public improvements or installations which are necessary as the result of the curb openings or driveways, shall be accomplished without any cost to the Town.



Also, any curb opening or driveway which has been abandoned shall be restored by the property owner, except where such abandonment has been made at the request of, or for the convenience of, the Town.

- 2.3.5 Driveway approaches, whereby the driveway is to serve as an entrance only or as an exit only, shall be appropriately signed by, and at the expense of, the property owner. The property owner will be required to provide some physical means of ensuring that the motorists will use the driveway either as an entrance only or an exit only, but not both.

### 2.3.6 Rural Road Access from Private Property

New driveway accesses from private property to an existing graveled Town road shall be required to install a minimum of six inches (6") of compacted Class 6 aggregate base course or equivalent material from the R.O.W. line to the edge of the traveled roadway. The width of the driveway within the R.O.W. shall be 16 to 22 feet and a minimum 24-inch diameter corrugated metal pipe (CMP) culvert, with flared end sections, shall be required at the established ditch flowline. A sketch plan of the installation must be submitted with the access pen-nit application. C.M.P. culverts are only allowed for private residential driveways, not for storm sewer or commercial driveways.

### 2.3.7 Access to Roadways with No Curb and Gutter

Private drive access to local, collector or arterial roadways that have no curb and/or gutter improvements shall be constructed to meet the following requirements:

- 2.3.7.1 Drive shall extend from R.O.W. line to edge of existing driving surface and shall be constructed of.

- A minimum of 5 inches of concrete pavement over 4 inches of Class 6 aggregate base material.
- A minimum of 3 inches of asphalt pavement over 6 inches of Class 6 aggregate base material, i.e., minimum acceptable roadway pavement design.

- 2.3.7.2 The drive entrance shall be a minimum of 16 feet wide (maximum 22 feet) in the Town R.O.W.

- 2.3.7.3 A 24-inch diameter CMP culvert, (or comparable size arch or elliptical pipe), shall be installed at the established roadside ditch flowline beneath the private drive access.



2.3.7.4 At no time will it be acceptable for asphalt or concrete pavement to be placed directly on the culvert.

2.3.8 Maintenance of the access and drainage improvements within Town R.O.W. shall be the responsibility of the adjacent property owner.

## 2.4 DEFINITION OF TERMS

Several terms are used herein which have a somewhat distinct meaning. For the purpose of clarity, the definitions of some of these terms are listed below:

Width of Curb Opening (W): The width of curb opening measured at the curb line. For commercial and industrial driveways see Table 2.1.

Edge Clearance (E): The distance measured along curb line from the nearest edge of the curb opening to a point where the property line extended intersects the curb line.

Corner Clearance (C): At an intersecting street, the distance measured along the curb line from the projection of the intersecting street flowline to the nearest edge of the curb opening,

Distance Between Double Driveways (D): The distance measured along the curb line between the inside edges of two adjacent curb openings.

Setback(S): The lateral distance measured perpendicular to the street R.O.W. line and extending from the R.O.W. line to the closest point of a building or gasoline service pump island.

Frontage: The distance along the street R.O.W. line of a single property or development within the property lines. Corner property at an intersection would have a separate frontage along each street.

Residential: Property used primarily for residential purposes such as single family, two-family and multi-family units.

- a. Single Family (SF) Residential - Single, detached family dwelling, units or double bungalows or duplexes.
- b. Multi Family (MF) Residential - Three or more attached dwelling units including, townhouses, condominiums and apartments.

Commercial: Establishments where the buying and selling of commodities,



entertainment or services is carried on. Included are such uses as service stations, office buildings, restaurants, hotels, motels, banks, grocery stores, theaters, parking lots, trailer courts and public buildings.

Service Station: Any property where flammable liquids used as motor vehicle fuel are stored and dispensed from fixed equipment into fuel tanks of motor vehicles.

Industrial or Warehouse: Any establishment that manufactures or stores an article or product.

## **2.5 GENERAL REQUIREMENTS**

### **2.5.1 Number of Openings**

SF Residential - In general, each SF residential property shall be limited to one access point.

MF Residential - in general, access shall be determined by information provided by the Developer in the Traffic Impact Analysis and by comments generated during the Town's review and acceptance of that study.

Commercial - In general, commercial property having less than 150 feet of frontage and located mid-block shall be limited to one access point to the street. An exception to this rule may be where a building is constructed in the middle of a lot and parking is provided for on each side of the building.

A second access point may be allowed for commercial property and service stations having more than 150 feet of frontage where there is sufficient frontage to provide for minimum and maximum requirements. For commercial property and service stations located on a corner, one access to each street may be permitted.

Industrial - Access shall be determined on a case-by-case basis. The Town shall consider good traffic engineering practice and the information provided by the applicant in the Traffic Impact Analysis accompanying his submittal.

### **2.5.2 Amount of Curb Opening Permitted**

The total length of curb opening on a street for access to a commercial property or service station shall not exceed 40 percent of the property frontage. This requirement does not apply to residential type curb openings.



### **2.5.3 Entrance Angle**

In general, the entrance angle for all driveway approaches shall be as near 90 degrees to the centerline of the street as possible. The minimum angle permitted is 80 degrees.

### **2.5.4 Minimum Space Between Openings (D)**

The minimum spacing between curb openings shall be 35 feet measured at the curb line. This spacing will apply to the distance between drives serving adjoining properties. This does not apply to residential projects using mountable curb, gutter, and sidewalks. A 50-foot spacing applies to commercial openings.

### **2.5.5 Joint Entrances**

As determined by the Town, joint entrances will be provided to serve two adjacent properties. Joint entrances are to be centered on the common property line.

### **2.5.6 Access Approaches**

Access approaches shall not be approved for parking or loading areas that require backing maneuvers within Town right-of-way. All off-street parking areas must include on-site maneuvering, areas and aisles to permit user vehicles to enter and exit the site in forward drive without hesitation.

**2.5.7** If a parcel of land with direct access has been in a state of non-use for more than four years, recommencement of access use shall be considered a change in use. If the use of the access exceeds the design limitations of the access or is non-conforming with the present code, a new permit may be required.

**2.5.8** If the use of an existing access to Town right-of-way changes, or there is a change in the use of the property, a new access permit may be required. Change in access or property use may include, but is not limited to, change in the amount or type of traffic, structural modifications, remodeling, change in type of business, expansion in existing business, change in zoning, change in property division creating new parcels, etc.

## **2.6 CONTROL DIMENSIONS**

To accomplish the objectives of the basic principles stated earlier, certain dimensions are necessary. There are many variables, which affect these dimensions. Some of the variables are as follows: type of street classification, private property development,



volume and type of traffic and width of right-of-way.

### 2.6.1 Width of Curb Opening (W)

The total width of curb opening for properties on various Functional Street Classifications shall be in conformance with Table 2.1

**TABLE 2.1**  
**WIDTH OF CURB OPENINGS (W) (in ft.)**

	RESIDENTIAL		COMMERCIAL	SERVICE STATION	INDUSTRIAL
	SF	MF			
<b>FREEWAY</b>	N/A	N/A	N/A	N/A	N/A
<b>MAJOR ARTERIAL</b>	IF ALLOWED UNDER 2.2.3.2.c, DESIGN AS COLLECTOR				
<b>MINOR ARTERIAL</b>	IF ALLOWED UNDER 2.2.3.2.c, DESIGN AS COLLECTOR				
<b>MAJOR COLLECTOR</b>	N/A	30-35	30-40	30-40	30-40
<b>MINOR COLLECTOR</b>	N/A	30-35	30-40	30-40	30-40
<b>LOCAL</b>	(**)	30-35	30-40	30-40	30-40

\*\*For single family residential access to local streets:

Local (Suburban - with curb-gutter-sidewalk)	=	16 to 30 feet
Local (Urban - without curb-gutter-sidewalk)	=	16 to 22 feet
Local (Rural - Ag. zoned)	=	16 to 22 feet

- Note:
1. Curb openings of 30 feet or more must be constructed as a radius curb return.
  2. If a radius curb return is used, the width of the allowed driveway is measured by NOT Counting the two (2) 20 foot radii, or in other words, it is measured at the throat extended to flowline.

### 2.6.2 Edge Clearance (E)

#### Residential

Arterial - None. (May not exceed the property line extended)

Local - None. (May not exceed the property line extended)

#### Commercial and Service Stations

Arterial - 25 feet minimum

Local - 25 feet minimum

Note: Joint access with adjoining property is encouraged. Joint access shall be





the only justification for reducing the minimum edge clearance dimension.

### **2.6.3 Corner Clearance (C)**

It is important to locate driveways away from major intersections. This constraint is as much for the ability to enter and leave the property, as for the benefit of intersection safety and operations. Exiting a driveway during peak-hour conditions at traffic signals is difficult where the queue of standing or slow-moving vehicles never allows a sufficient gap for entry from the driveway.

### **2.6.4 Sight Distance**

Sight distance for curb openings to private property shall consist of a sight triangle conforming to the requirements of Section I of these Regulations. This does not apply to driveways in single family residential projects using mountable curb, gutter, and sidewalks.

## **2.7 UNPERMITTED ACCESS**

Any access, driveway, or curb-cut which is constructed within Public Right-of-Way without an access permit issued by the Town shall be subject to a "Stop Work" order, and shall be removed immediately. Failure to remove the non-permitted access may result in the removal of said access by the Town, (the cost for removal shall be charged to the property owner). Failure to obey the "Stop Work" order may result in the prosecution of the violators.



# **CHAPTER 3**

## **PAVEMENT DESIGN AND TECHNICAL CRITERIA**

## TABLE OF CONTENTS

Section	Title	Page
3.1	General .....	3.1
3.2	Subgrade Investigation.....	3.4
3.3	Pavement Design Criteria .....	3.6
3.4	Pavement Design Procedure .....	3.10
3.5	Subgrade Investigation and Pavement Design Report.....	3.13

## TOWN OF SUPERIOR

### CHAPTER 3 PAVEMENT DESIGN AND TECHNICAL CRITERIA

#### 3.1 GENERAL

3.1.1 This chapter provides the basic criteria and design procedures for roadway pavements. Recommended design methodologies for asphalt and Portland cement concrete are addressed and essentially follow the Colorado Department of Transportation (CDOT) methodology. Some standardization of criteria has been made in design procedures.

#### 3.1.2 Pavement Design Report Submittal Options

There are two acceptable submittal options for pavement design geotechnical reports related to the final construction plans:

3.1.2.1 The final pavement design may be completed concurrent with the final construction plans, with the pavement section dimensions and pavement material and construction specifications included in the final construction plan submittal. All soil samples must be taken after overlot grading has been completed.

3.1.2.2 The final pavement design may be completed and submitted after Town approval of the associated street plan, profile and drainage final construction plans. Pavement design shall occur prior to any paving and after overlot grading.

If the first option is chosen, the Developer may obtain all necessary construction permits when the final construction plans are approved by the Town. If the second option is used, the Developer may obtain pavement construction permits only after the final construction plans, which include the pavement design, are approved by the Town. If the second option is used, the application for pavement design approval must be in accordance with this chapter.

3.1.2.3 If a street is to be built in phases, (i.e., the center two lanes are built first, then at some later date more lanes are added), a new pavement design investigation and report for the additional lanes will be required if it has been at least two years since the original design was made.



### 3.1.3 Preliminary Pavement Design Reports

For all Town land development approvals that involve a subdivision improvements agreement for roadway construction, upon the request by the Engineering Division, the Developer must provide, at minimum, a preliminary subgrade investigation and pavement design report that recommends typical pavement structural section based on the known site soil conditions and the valid Traffic Impact Analysis. The preliminary reports shall use the Equivalent (18 kip) Daily Load Applications (EDLA) of Table 3.2. This preliminary pavement design serves as a justification of the roadway improvement costs included in the Subdivision Improvements Agreement or Public Improvements Agreement.

A preliminary pavement design may be submitted with final construction plans for Developers using submittal Option 2 in Section 3.1.2. Table 3.1 provides a checklist for subgrade investigation and pavement design.

**TABLE 3.1**  
**SUBGRADE INVESTIGATION AND PAVEMENT DESIGN CHECK LIST**

SOIL CONSULTANT		OK		REVIEWED BY	REJECTED
SUBDIVISION				COMMENT	
FILING	JOB NO.				
STREET					
DATE		YES	NO		
1.	VICINITY MAP				
2.	DRAWING WITH LOCATION OF BORINGS				
3.	DRAWING WITH ESTIMATED EXTENT OF				
	SOIL TYPES AND EDLA				
4.	DRAWING WITH PAVEMENT ALTERNATIVES				
5.	ATTERBERG LIMITS & % 200 PASSING NO. SIEVES				
6.	CORRECT SOIL CLASSIFICATION				



**TABLE 3.1 (CONT'D)**  
**SUBGRADE INVESTIGATION AND PAVEMENT DESIGN CHECK LIST**

SOIL CONSULTANT		OK		REVIEWED BY	REJECTED
				COMMENT	
SUBDIVISION					
FILING	JOB NO.				
STREET					
DATE		YES	NO		
7.	COMPOSITE SAMPLES: CORRECTLY GROUPED AT 250' MAXIMUM INTERVALS				
8.	FOR CBR TESTING: - Moisture-density curves - Stress-strain curves of CBR's shown - Surcharge weights (correct unit weights, intensity of loading equal to mass of pavement design $\pm$ 5 lbs. - Percentage of swell on stress-strain curves - Moisture content & dry density for each sample				
8b.	FOR R-VALUE TESTING: - Dry density & moisture content for each sample - Expansion pressure for each sample - Exudation pressure - R Value curve				
9.	DESIGN NOMOGRAPH SHOWN WITH CORRECT SOIL SUPPORT & EDLA				
10.	CORRECT DESIGN COEFFICIENT USED FOR ASPHALT, BASE COURSE, ETC.				
11.	DESIGN CALCULATIONS SHOWN FOR ALL PHASES OF SOIL REPORT				
12.	MINIMUM PAVEMENT SECTIONS MET FOR PROPER CLASSIFICATION				
13.	SPECIAL PROBLEMS (expansion, frost heave, groundwater) WITH DESIGN & CONSTRUCTION PROBLEMS				
14.	IF THE DENVER/COLORADO/CONSOLIDATION SWELL TEST SHOWS OVER 2.00% SWELL, PROPOSED MITIGATIVE MEASURES ACCEPTABLE TO ENGINEER				



## 3.2 SUBGRADE INVESTIGATION

### 3.2.1 Field Investigation

The field investigation shall consist of borings or other suitable methods of sampling subgrade soils to a depth of at least five (5) feet below proposed subgrade elevation, (10 feet below proposed subgrade on arterial roadways), at spacings of not more than 250 feet, unless otherwise accepted by the Engineering Division. Every fifth hole shall be ten (10) feet deep. Samples shall be taken after grading is completed and the subgrade is rough cut.

### 3.2.2 Classification Testing

Each subgrade sample shall be tested to determine Liquid Limit, Plastic Limit, Plasticity Index, Atterberg Limits and the percentage passing the U.S. Standard No. 200 sieve.

Samples of sands and gravels may require gradation analysis for classification determination. These data shall be determined using the following methods:

Liquid Limit - AASHTO T 89 (ASTM D 4318)

Plastic Limit - AASHTO T 90 (ASTM D 4318)

% Passing No.200 - AASHTO T 11 (ASTM C 117)

Gradation - AASHTO T 27 (ASTM D 422)

The results of these tests shall be used to calculate the AASHTO Classification and Group Index using AASHTO M 145.

### 3.2.3 Soil Grouping

To facilitate subgrade support testing, soil samples collected in the field investigation can be combined to form soil groups. These groups shall be based upon the AASHTO Classification, Group Index and location within the area investigated. Groupings shall not consist of samples with different AASHTO Classifications. (Note: there may be more than one group within a given classification). Composite samples can be manufactured by combining small portions of each subgrade sample contained within the group and mixing to provide a uniform composite sample of the soil group. Composite samples shall be subjected to Classification Testing as outlined in Item 3.2.2.



### 3.2.4 Subgrade Support Testing

Individual subgrade or composite samples shall be tested to determine the subgrade support value using either CBR (California Bearing Ratio) or Hveem Stabilometer (R-value) testing. These values shall be used in the design of pavement sections in accordance with the procedures outlined in Section 3.4. Tests shall be conducted in accordance with the procedures listed below in Items 3.2.4.1 or 3.2.4.2.

#### 3.2.4.1 CBR Tests: California Bearing Ratio tests shall be conducted in accord with AASHTO T 193 with the following modifications:

- a. Note 4 of AASHTO T 193 shall not apply. A 3 point CBR evaluation is required.
- b. The requirement for compaction shall be in accordance with the most recent edition of the *CDOT Road and Bridge Standards and Specifications*.
- c. Surcharge shall be calculated using a unit weight of 140 pcf for bituminous pavement, and 135 pcf for untreated aggregate base course.
- d. The design CBR Value shall be determined from the CBR -- Dry Density Curve and shall be the CBR value at 95 percent compaction. A minimum CBR value of 6 will be required for the subgrade over a depth of two feet.
- e. In addition to the values requested in AASHTO T 193, Stress-Penetration curves for each sample, a CBR - Dry Density curve and Proctor Compaction test results shall be reported.

#### 3.2.4.2 R-Value Tests: Hveem Stabilometer tests shall be conducted in accordance with AASHTO T 190. The design R-value shall be at 300 psi exudation pressure. The reported data shall consist of:

- a. Dry density and moisture content for each sample.
- b. Expansion pressure for each sample.
- c. Exudation Pressure - corrected R-value curve showing the 300 psi design R-value.
- d. A minimum R-value of 15 shall be required for all subgrade to a depth of two feet.

#### 3.2.4.3 Swell Test: A Colorado Swell Test, (also referred to as the Denver Swell Test or Swell Consolidation Test), shall be required in all pavement design reports.





If the swell, (at an overburden pressure of 100-150 psf, at specified compaction per CDOT and at optimum moisture content), is 2.0% or greater, the pavement design report must provide mitigating measures to minimize the destructive swell potential. Since the pavement is not placed on the soils until after the soil has been scarified, moisture treated, and compacted to optimum, the "% swell" shall be measured from the point after the overburden pressure is applied, to the point after water is added. In other words, after the overburden pressure is applied and consolidation has occurred, the "swell" = 0.0%, then add water and measure the swell. Mitigation could be over-excavation and replacement with suitable non-expansive material to a depth sufficient to protect the pavement, lime treatment, french drains, or other procedures acceptable to the Town Engineer, as recommended and supported by a geotechnical engineer. Moisture treatment, by itself, may not be an adequate mitigating measure. If expansive soil mitigation is made, the soil treatment shall extend to the back-of-curb (if detached walk or no walk), or to the back-of-walk (if attached or monolithic walk).

### 3.3 PAVEMENT DESIGN CRITERIA

#### 3.3.1 General

This section provides the parametric input data to be used for the design of pavements of various roadway classifications.

#### 3.3.2 Equivalent (18 Kip) Daily Load Applications (EDLA)

The pavement design procedure in this chapter provides for a 20-year service life of pavement, given that normal maintenance is provided to keep roadway surface in an acceptable condition. EDLA and Design Traffic Number (DTN) are considered equivalent units, based on 20-year design criteria and an 18 kip axle loading. All data and design nomographs in this chapter use EDLA units for pavement loading repetitions.

EDLA criteria for each Town roadway classification are given in Table 3.2.



**TABLE 3.2**  
**RECOMMENDED EQUIVALENT (18 Kip) DAILY**  
**LOAD APPLICATIONS (EDLA)**

CLASSIFICATION	CLASS MODIFIER	EDLA VALUES <sup>1</sup>
Local/Private/Alley	Residential	
	Serving < 80 D.U.'s	5
	All Others	10
	Commercial <sup>2</sup>	30
	Office	100
Minor Collector	Residential	30
	Commercial <sup>2</sup>	50
	Office <sup>2</sup>	150
Major Collector <sup>2</sup>	Residential	100
	Commercial <sup>2</sup>	100
	Office <sup>2</sup>	150
Minor Arterial <sup>2</sup>	All	200
Major Arterial <sup>2</sup>	All	200
Entry Street		10
	EDLA MINIMUM	
	(EDLA may be required to be 30 if number of DU's served is over 100)	

Notes: <sup>1</sup>Alternative EDLA values may be considered with justification provided by the Traffic Impact Analysis, proposed land uses, and traffic analysis that defines proportion of truck vehicles.

<sup>2</sup>EDLA shall be calculated based on projected traffic uses. Minimum EDLA values are as prescribed in Table 3.2.

### 3.3.3 Design Serviceability

The following criteria shall be used for all Town roadways to be dedicated for public use:



**TABLE 3.3**  
**SERVICEABILITY INDEX**

ROADWAY CLASSIFICATION	SI
Arterials (minor, major)	2.5
COLLECTORS	
Major	2.5
Minor Commercial/Office	2.5
Minor Residential	2.5
LOCAL	
Residential	2.0
Commercial/Office	2.5
ALLEYS/PRIVATE ROADS	2.0

#### **3.3.4 Minimum Pavement Section**

This paragraph provides the minimum acceptable pavement sections for public roadways in Town. These pavement thicknesses may be used for preliminary planning purposes or for estimating collateral requirements for subdivision improvement agreements. Final pavement designs must be based on actual subgrade support test results. Table 3.4 lists these minimum thicknesses for each roadway classification.



**TABLE 3.4**  
**REQUIRED MINIMUM PAVEMENT SECTIONS**

CLASSIFICATION	EDLA	COMPOSITE SECTION			
		ASPHALT (Inches)	TREATED SUBGRADE OR BASE (Inches)	FULL DEPTH ASPHALT (Inches)	PORTLAND CEMENT CONCRETE (Inches)
Alleys	(Table 3.2)	3	6	5.0	5.0
Private Road	(Table 3.2)	3	6	5.0	5.0
Local					
Residential	(Table 3.2)	3	6	5.0	5.0
Commercial	30	3	6	5.0	6.0
Office	100	4	6	6.0	6.0
Minor Collector					
Residential	30	3	6	5.0	6.0
Commercial	50	4	6	6.0	6.0
Office	150	4.5	6	6.5	6.0
Major Collector					
Residential	100	4	6	6.0	6.0
Commercial	100	4	6	6.0	6.0
Office	150	4.5	6	6.5	6.0
Minor Arterial	200	5	6	7.0	6.0
Major Arterial	200	5	6	8.0	6.0

### 3.3.5 Flexible Pavement Strength Coefficients

Table 3.5 contains the standard design coefficients for various pavement materials. Nonstandard design coefficients may be used, only if approved in advance by the Engineering Division. In addition, design values must be verified by predesign mix test data and supported by daily construction tests; or, redesign values will be required; i.e., such as - Add 1/2 to 1" to the in-place surface course of final Asphalt Concrete.



**TABLE 3.5**  
**STRENGTH COEFFICIENTS**

PAVEMENT STRUCTURE COMPONENT*	STRENGTH COEFFICIENTS	(LIMITING TEST CRITERIA)
<b>CONVENTIONAL MATERIALS</b>		
Plant Mix Seal Cost	.25	
Hot Bituminous Pavement	.40	(1,500 lbs. Marshall or Rt 90+)
Exist Bituminous Pavement	.30	(9-15 yr)
	.24	(> 15 yr)
Aggregate Base Course	.12	(CBR 80+ or R 78+)
Exist Aggregate Base Course	.10	(CBR 50 + or R 69+)
Granular Subbase Course	.07	(CBR 15 or R 50+)
<b>TREATED MATERIALS</b>		
Cement Treated Aggregate Base	.23	(7 day, 640-1000psi)
Lime Treated Subgrade	.14	(7 day, 160 psi, Pl. < 6)

\*The combination of one or more of the following courses placed on a subgrade to support the traffic load and distribute it to the roadbed.

- a. Subbase. The layer or layers of specified or selected material of designed thickness placed on a subgrade to support a base course, surface course or both.
- b. Base Course. The layer or layers of specified or selected material of designed thickness placed on a subbase or a subgrade to support a surface course.
- c. Surface Course. One or more layers of a pavement structure designed to accommodate the traffic load, the top layer of which resists skidding, traffic abrasion, and the disintegrating effects of climate. The top layer is sometimes called "Wearing Course."

### **3.3.6 Portland Cement Concrete Working Stress (f)**

The working stress (f) to be used in the design shall be 75% of that provided by third-point beam loading, which shall have a minimum laboratory 28-day strength of 600 psi based on actual tests of materials to be used.

## **3.4 PAVEMENT DESIGN PROCEDURE**

### **3.4.1 Flexible Pavements**

The following procedure should be used in determining the Structural Number (SN) of the pavement being designed:



3.4.1.1 Determine roadway classification and corresponding EDLA (Table 3.2)

3.4.1.2 Determine the Serviceability Index (SI) of the roadway classification (Table 3.3)

3.4.1.3 Select the proper nomograph:

Table 3.6 Flexible Pavements with SI = 2.0

Table 3.7 Flexible Pavements with SI = 2.5

3.4.1.4 Using subgrade CBR or R-value test results and EDLA, determine the SN from the appropriate design nomograph.

3.4.1.5 Once the Structural Number (SN) has been determined, the design thickness of the pavement structure can be determined by the general equation:

$$SN = a_1 D_1 + a_2 D_2 + a_3 D_3 + \dots$$

Where:

$a_1$  = Hot Bituminous Pavement (HBP) strength coefficients

$a_1, a_2, a_n$  = strength coefficients of additional pavement components

$D_1$  = thickness of Hot Bituminous Pavement (HBP) (inches)

$D_2, D_3, D_n$  = thickness of additional pavement component sections

The strength coefficients for various components of the pavement structure are given in Table 3.5.

The component thickness selected must meet two conditions.

- a. Total HBP thickness selected cannot be less than the minimum specified in Table 3.4 for the roadway classification.
- b. The base course thickness selected cannot exceed 2.5 times the HBP thickness selected.

3.4.1.6 The design must reference any mitigation measures required when the subgrade contains swelling soils, (swell potential > 2.00% under 100-150 psf surcharge pressures at 95% standard compaction from a



Colorado (Denver) Swell Test; moisture treatment is not an adequate mitigative procedure). Design reports recommending permeable layers such as untreated aggregate base course in the pavement system, must present the measures to be used to ensure adequate drainage of such layers, and to maintain segregation of the layers from the swelling soils. Also, see Section 8.3, Roadway Subgrade Preparation. If expansive soil mitigation is made, the soil treatment shall extend to the back-of-curb, (if detached walk or no walk), or to the back-of-walk, (if attached or monolithic walk).

- 3.4.1.7 If the entity responsible for paving the street so chooses, a one-year warranty period may be employed, instead of the normal two (2) year warranty period, by using the following procedure:

Pavement design report shall state that, at initial construction, the contractor shall pave one-half inch (1/2") less than the asphalt thickness arrived at in Section 3.4.1.5. above. Then, after the end of the first year of the two-year warranty period, (and after all punchlist repairs have been made), the Developer shall either escrow sufficient money for the Town to pave a one-inch (1") CX overlay within the next five (5) years, or the Developer may pave a one-inch (1") CX overlay himself. (Example: If Section 3.4.1.5. says the pavement section should be 5.5" full-depth asphalt, the report shall instruct the contractor to pave 5.0" at initial construction, leaving the finish asphalt 1/2" below the lip of the gutter. Then after one year, (and after all warranty repairs have been made), the Developer may either escrow the money, or do a 1.0" CX overlay, prior to the Town accepting the streets for full-term maintenance).

### 3.4.2 Rigid Pavement

The design of rigid pavements is a function of structural quality of the subgrade soil (R-value or CBR), traffic (EDLA), and the strength of the concrete (working stress). In comparison to the strength of the concrete slab, the structural contributions of underlying layers to the capacity of the pavement are relatively insignificant. Therefore, the use of thick bases or subbases under concrete pavement to achieve greater structural capacity is considered to be uneconomical and is not recommended.

Use the following procedure to obtain required thickness:

- 3.4.2.1 Determine roadway classification and corresponding EDLA (Table 3.2)



3.4.2.2 Determine design Serviceability Index (SI) of the roadway (Table 3.3)

3.4.2.3 The working stress of the concrete is to be obtained from laboratory tests. For preliminary design, this value shall be assumed to be 450 psi, until laboratory tests have been completed.

3.4.2.4 Select the proper nomograph

Table 3.8 Rigid Pavement with SI = 2.0

Table 3.9 Rigid Pavement with SI = 2.5

3.4.2.5 Using EDLA and working stress data, locate point on the pivot line; connect this point to the R-value or CBR value on the soil support scale to determine slab thickness.

3.4.2.6 Use slab thickness from step 3.4.2.5 or the minimum thickness from Table 3.4.

3.4.2.7 The design must reference any mitigation measures required when the subgrade contains swelling soils, (swell potential >2.00% under 100-1 50psf surcharge pressures at 95% standard compaction from Colorado (Denver) Swell Test; moisture treatment is not an adequate mitigative procedure). Design reports recommending permeable layers, such as untreated aggregate base course in the pavement system, must present the measures to be used to ensure adequate drainage of such layers, and to maintain segregation of the layers from the swelling soils. Also, see If expansive soil mitigation is made, the soil treatment shall extend to the back-of-curb (if detached walk or no walk), or to the back-of-walk (if attached or monolithic walk).

### 3.5 SUBGRADE INVESTIGATION AND PAVEMENT DESIGN REPORT

The report shall be prepared by or under the supervision of and signed by a Professional Engineer, registered in the State of Colorado, and shall include the following information:

- A. Vicinity map to locate the investigated area.
- B. Scaled drawings showing the location of borings.
- C. Scaled drawings showing the estimated extent of subgrade soil types and EDLA for each street.

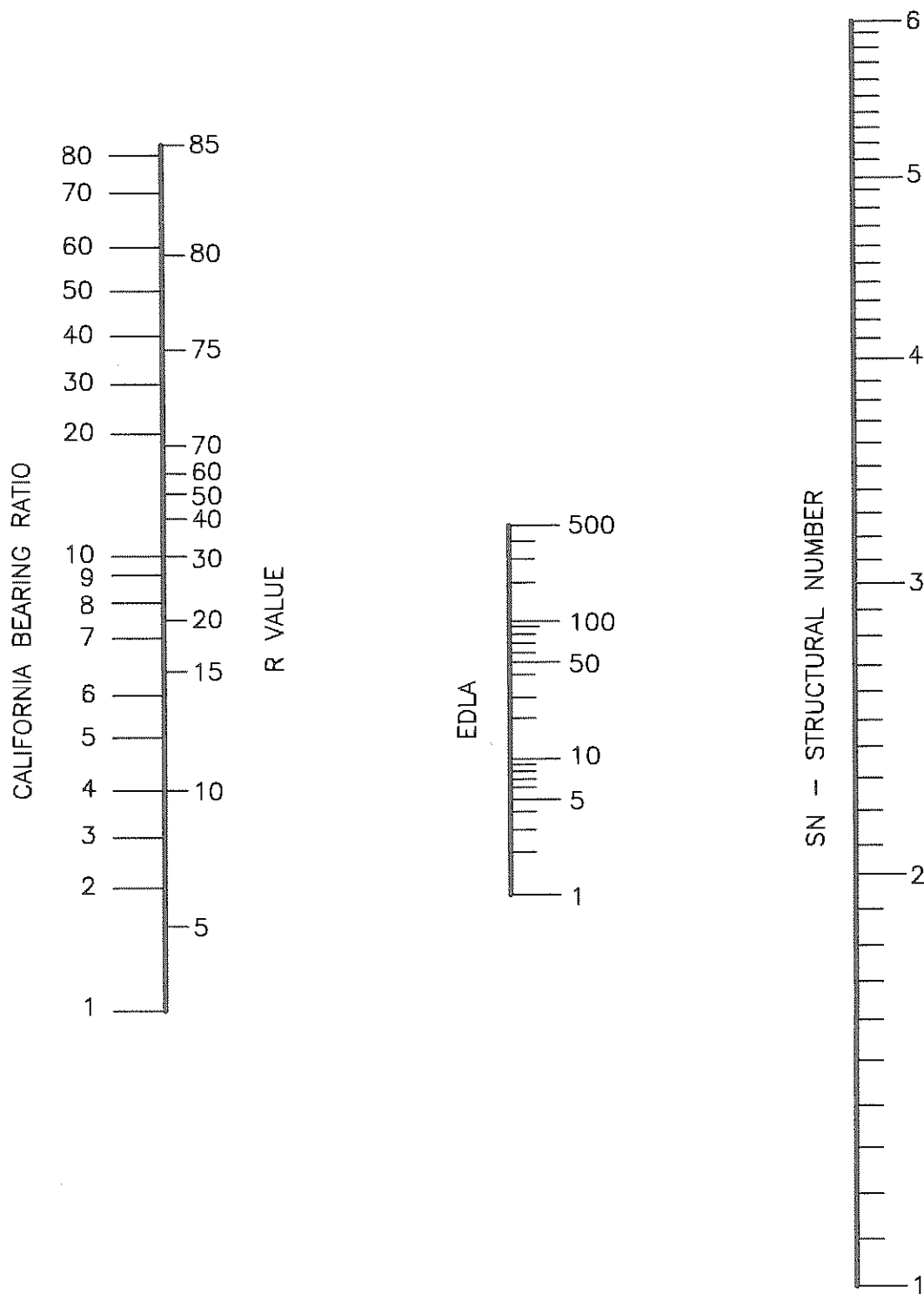




- D. Pavement design alternatives for each street on a scaled drawing,
- E. Tabular listing of sample designation, sample depth, Group Number, Liquid Limit, Plasticity Index, percent passing the No. 200 sieve, AASHTO Classification, Group Index and soil description.
- F. CBR or R-value test results of each soil type used in the design.
- G. Pavement design nomographs properly drawn to show Soil Support - EDLA - SN.
- H. Design Calculations:
- A discussion regarding potential subgrade soil problems including, but not limited to:
1. heave or settlement prone soils;
  2. frost susceptible soils;
  3. ground water;
  4. drainage considerations (surface and subsurface);
  5. cold weather construction (if appropriate); and
  6. other factors or properties which could affect the design or performance of the Pavement System.
- J. Recommendations to alleviate or mitigate the impact of problems discussed in Item I above.

NOTE: If any new fill material is imported on site from other areas during the construction phases of a Project, the Town may require a new pavement design report or additional testing to verify the acceptability of this material for roadway fill.





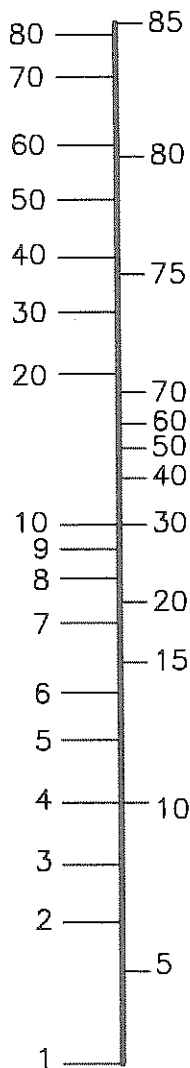
ROADWAY DESIGN STANDARDS

STANDARD DRAWING

NOMOGRAPH FOR FLEXIBLE PVMNT  
DESIGN WITH SI=2.0

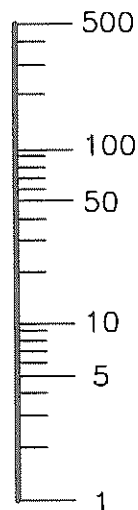
TABLE 3-6

CALIFORNIA BEARING RATIO

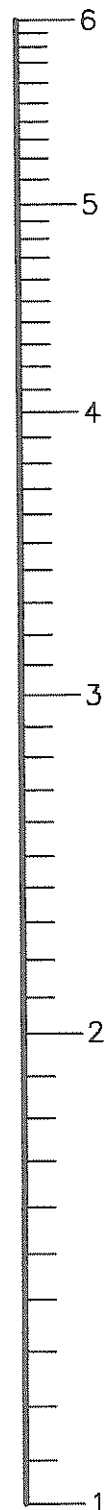


R VALUE

EDLA



SN - STRUCTURAL NUMBER

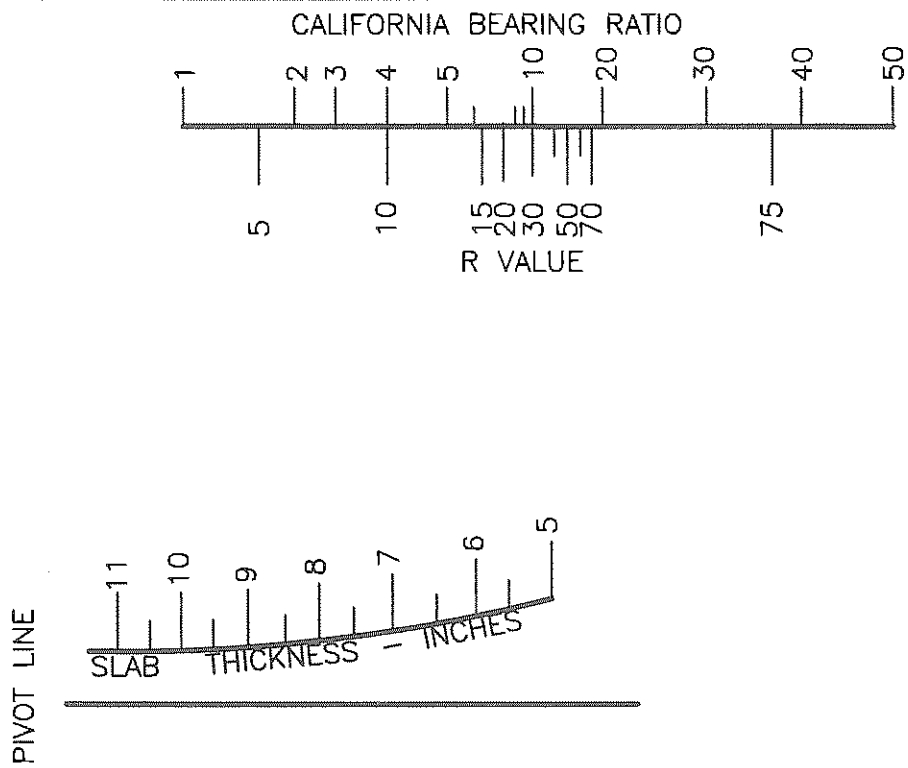


ROADWAY DESIGN STANDARDS

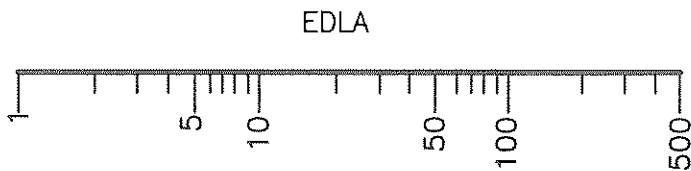
STANDARD DRAWING

NOMOGRAPH FOR FLEXIBLE PVMNT  
DESIGN WITH SI=2.5

TABLE 3-7



$f_t$  - WORKING STRESS IN CONCRETE (psi)

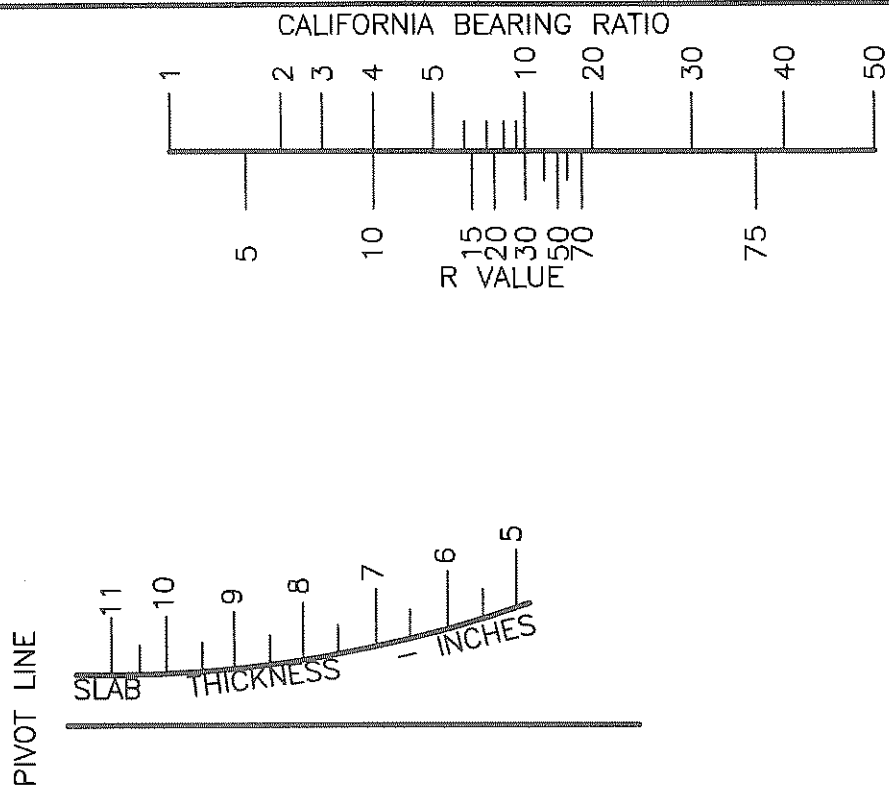


ROADWAY DESIGN STANDARDS

STANDARD DRAWING

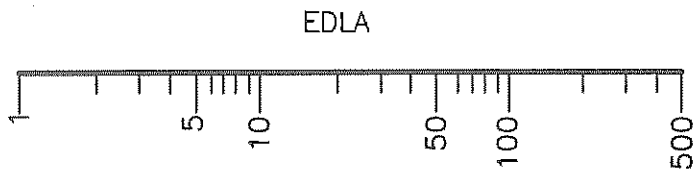
NOMOGRAPH FOR RIGID PAVEMENT  
DESIGN WITH SI=2.0

TABLE 3-8



200 300 400 500 600 700

$f_t$  - WORKING STRESS IN CONCRETE (psi)



ROADWAY DESIGN STANDARDS

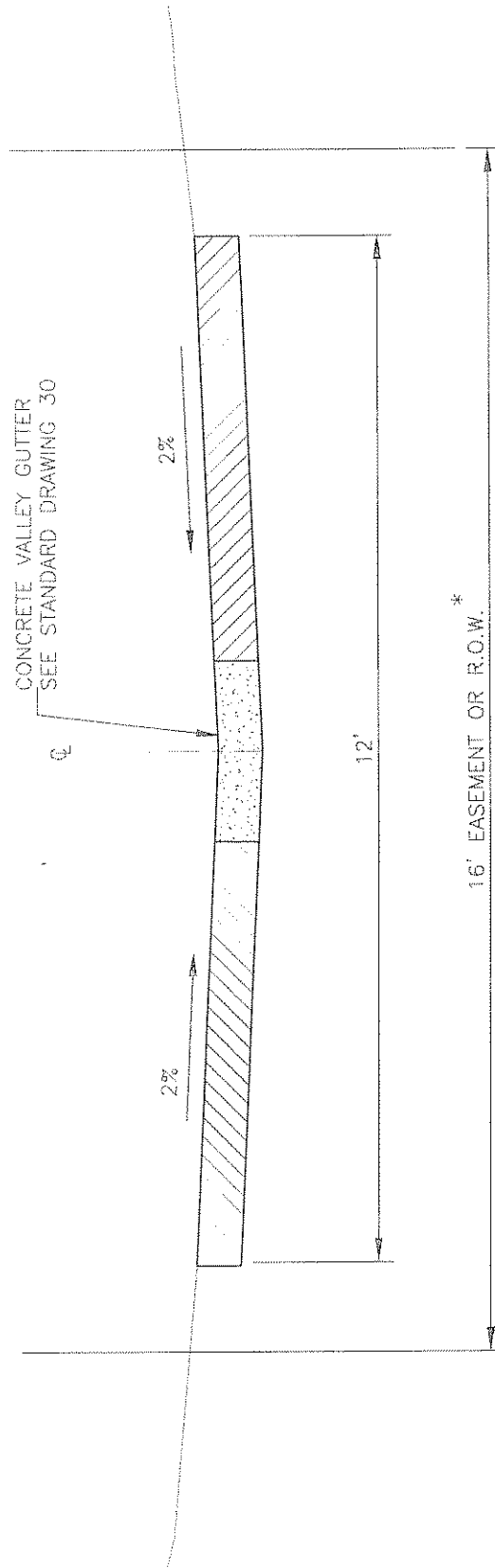
STANDARD DRAWING

NOMOGRAPH FOR RIGID PAVEMENT  
DESIGN WITH SI=2.5

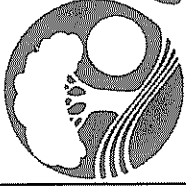
TABLE 3-9

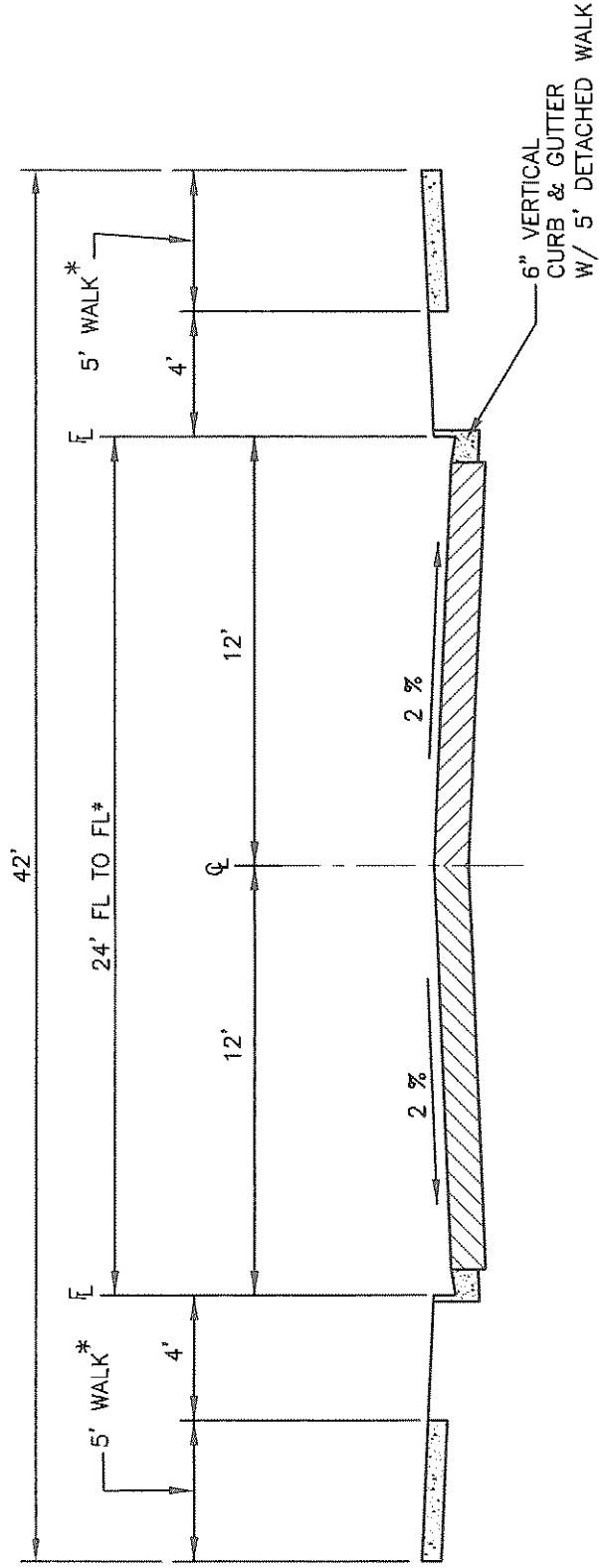
# APPENDIX

## ROADWAY STANDARDS

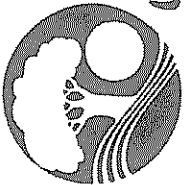


\* ADDITIONAL R.O.W. OR EASEMENT WIDTH MAY BE REQUIRED BASED ON UTILITY REQUIREMENTS.

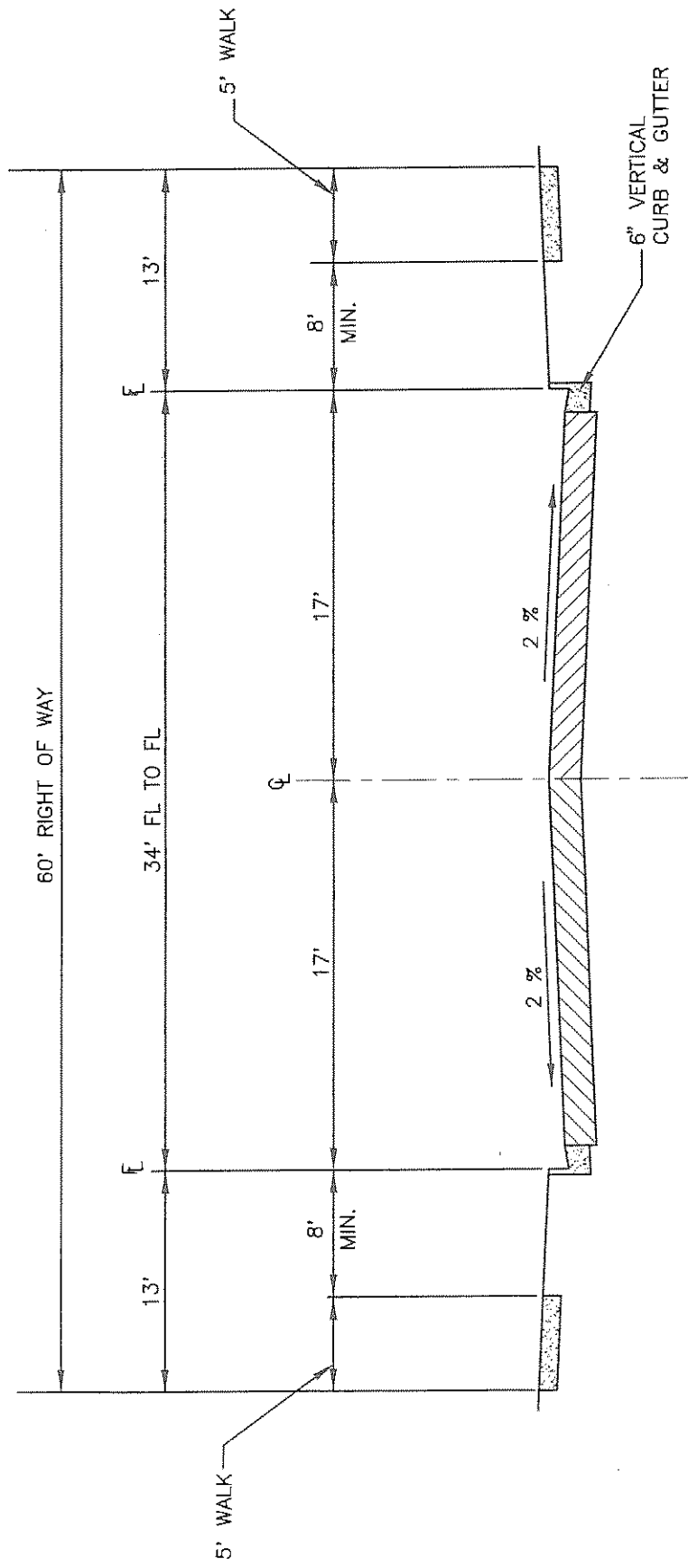
	ROADWAY DESIGN STANDARDS	STANDARD DRAWING
	ALLEY SECTION	1



\* PAVEMENT WIDTH AND SIDEWALK REQUIREMENTS MAY BE MODIFIED BASED ON ACCESS NEEDS, PARKING AND TRAFFIC VOLUMES.

STANDARD DRAWING	ROADWAY DESIGN STANDARDS	
2	PRIVATE STREET SECTION	



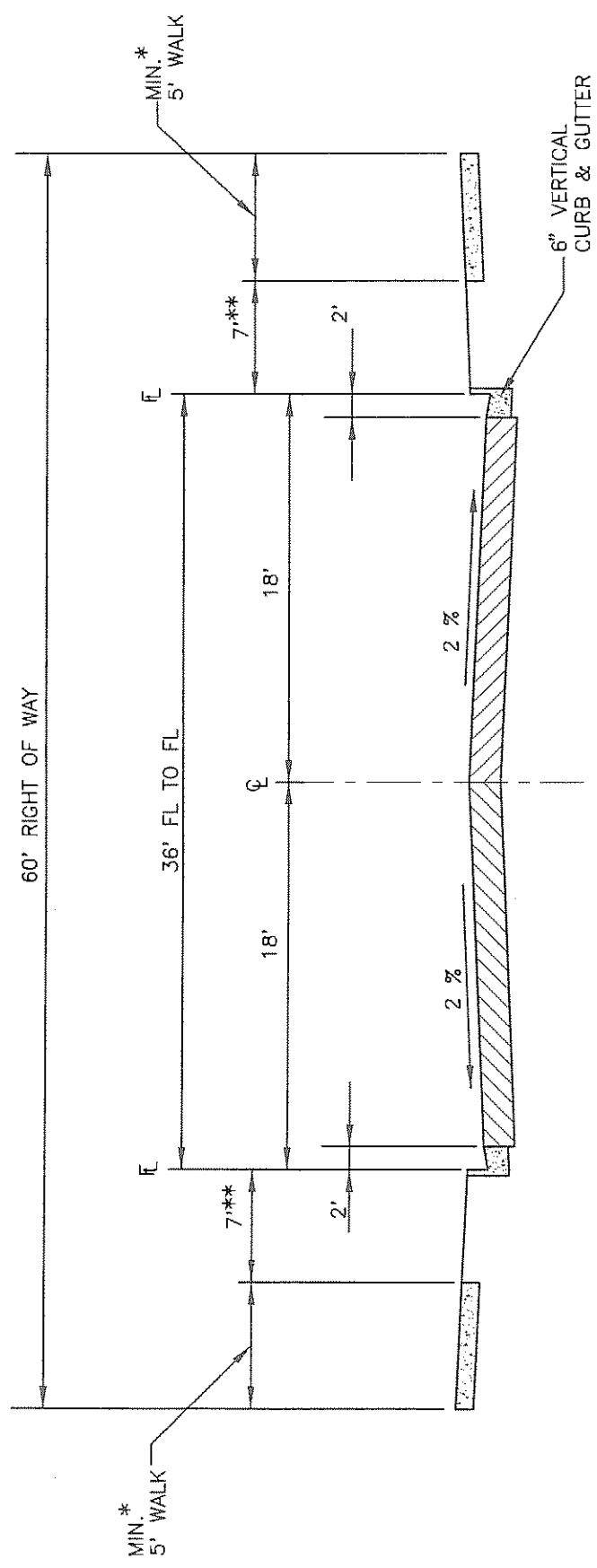


ROADWAY DESIGN STANDARDS

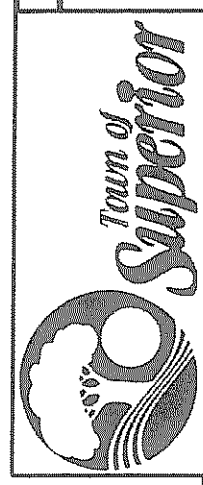
LOCAL STREET SECTION

STANDARD DRAWING

3



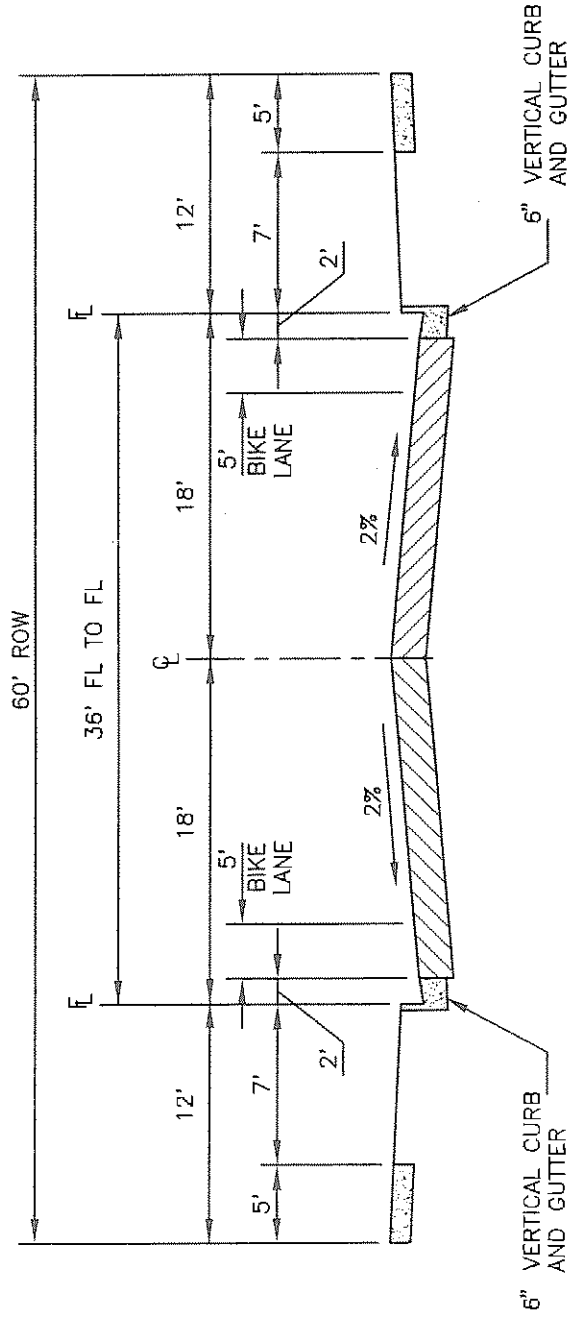
\* WIDER WALK MAY BE REQUIRED DEPENDING UPON PEDESTRIAN VOLUMES.  
 \*\* DIMENSION MAY BE REDUCED FOR WIDER WALK.  
 \*\*\* IN CERTAIN CASES ATTACHED WALK MAY BE ACCEPTABLE BASED ON TOWN ENGINEER'S APPROVAL.



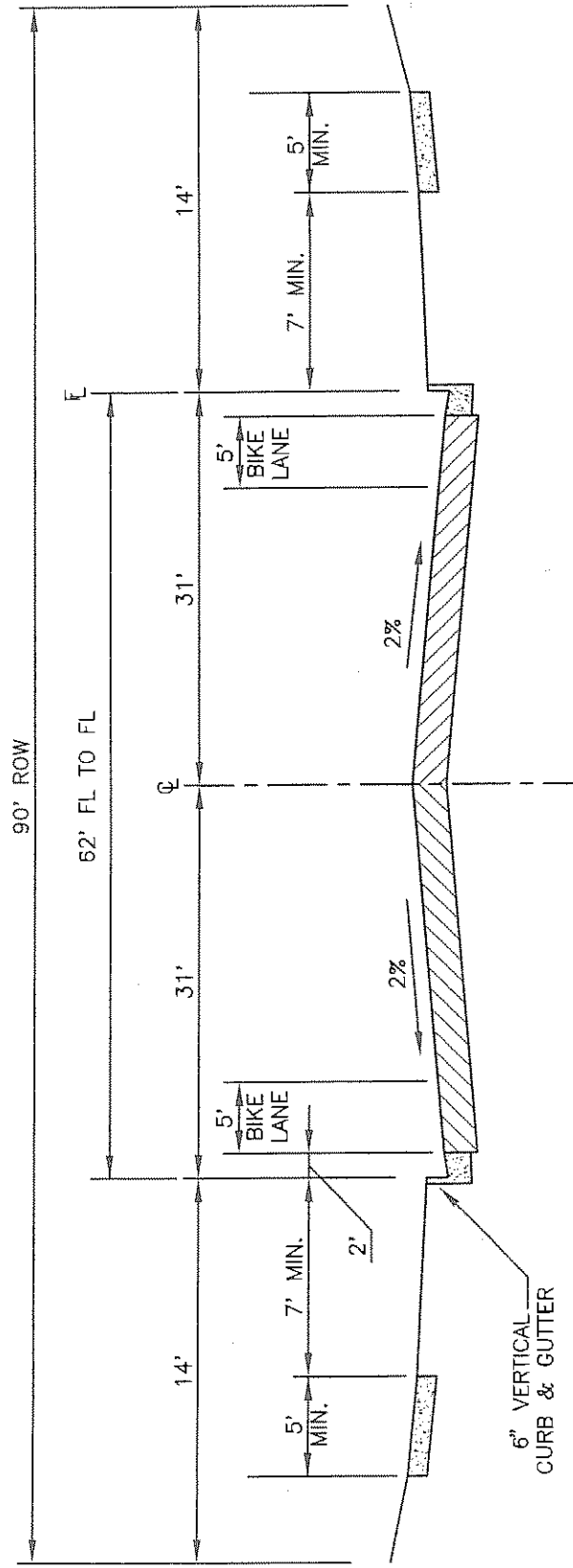
STANDARD DRAWING

ROADWAY DESIGN STANDARDS

COMMERCIAL/OFFICE STREET SECTION



ROADWAY DESIGN STANDARDS	STANDARD DRAWING
MINOR COLLECTOR STREET SECTION	5

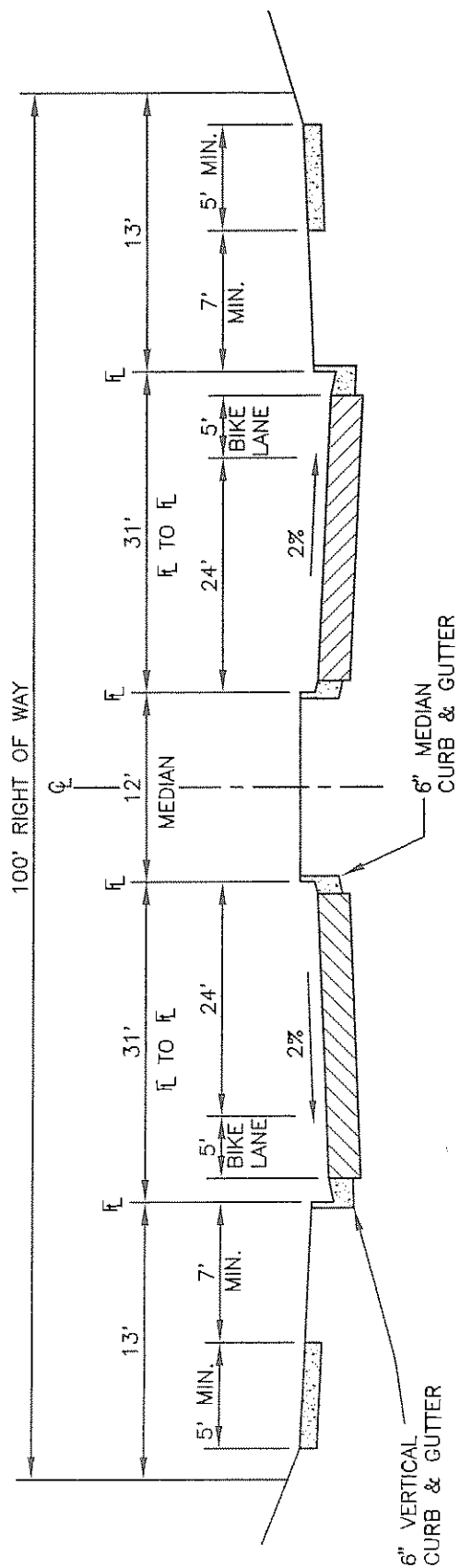


ROADWAY DESIGN STANDARDS

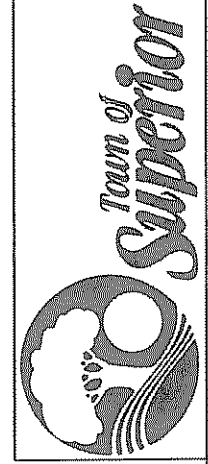
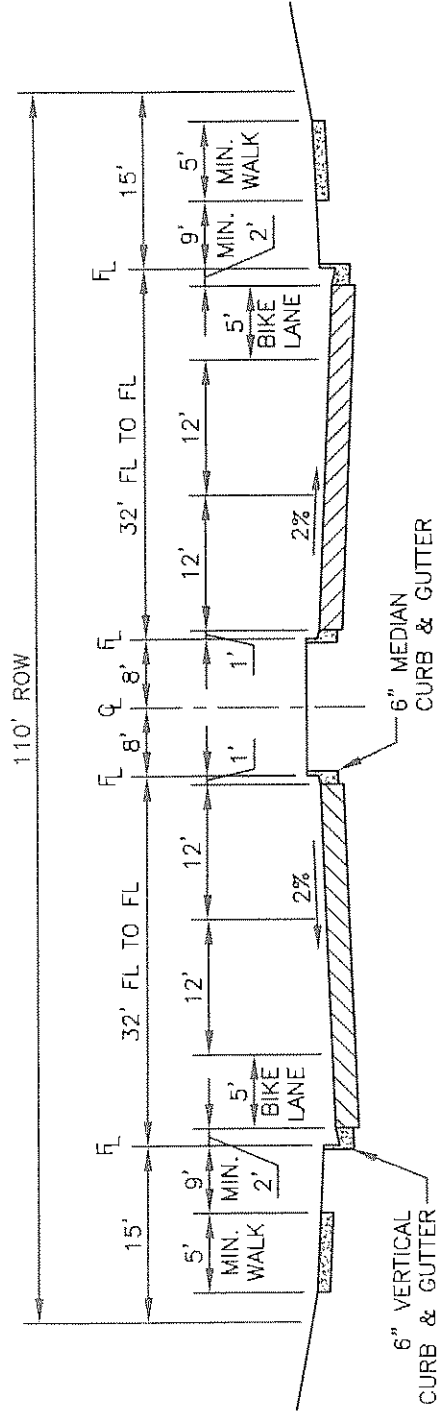
MAJOR COLLECTOR STREET SECTION  
WITHOUT MEDIAN

STANDARD DRAWING

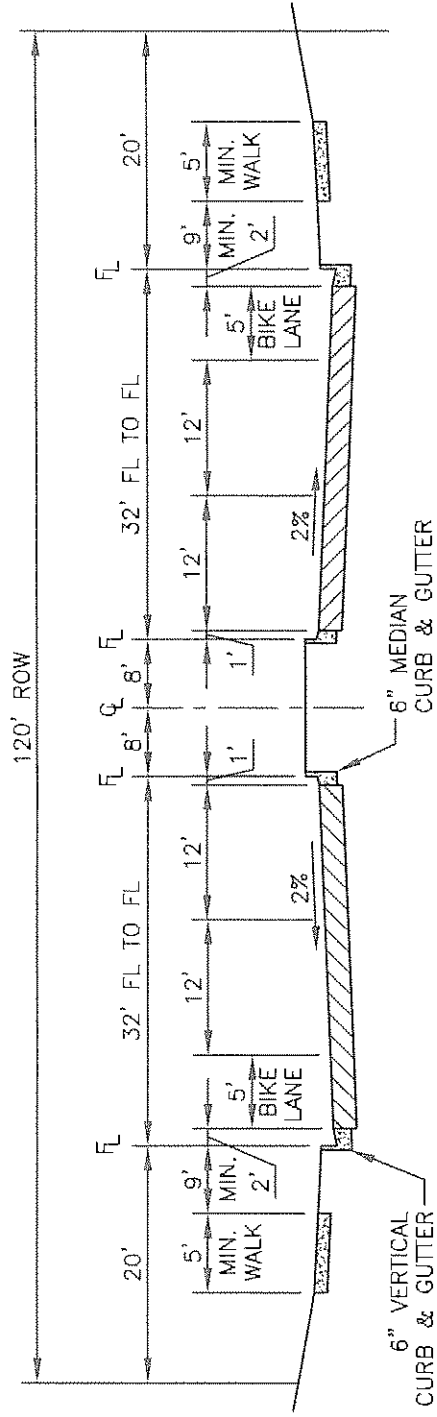
6



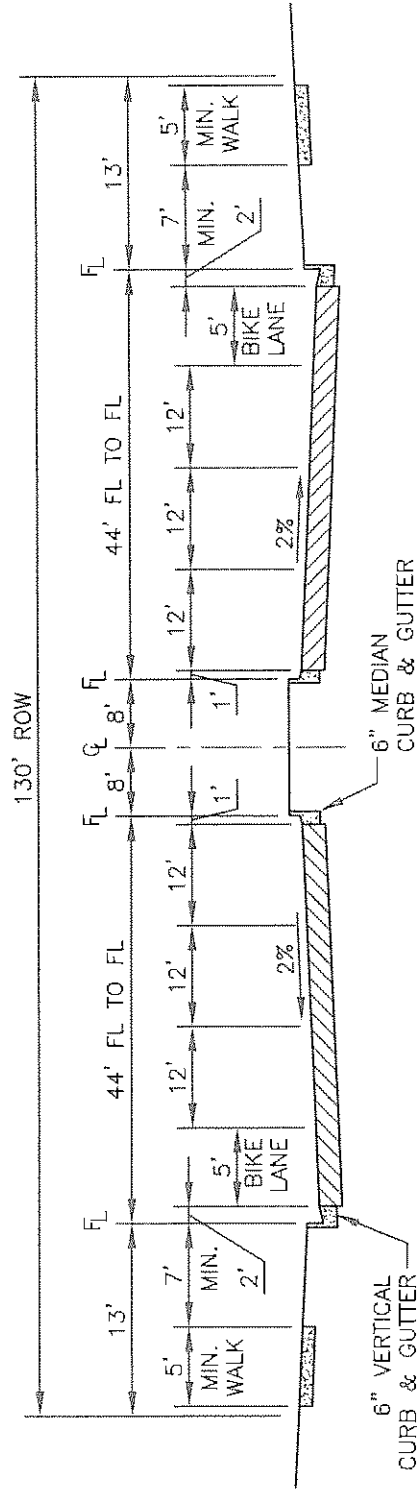
STANDARD DRAWING	ROADWAY DESIGN STANDARDS	
7	MAJOR COLLECTOR WITH MEDIAN STREET SECTION	



ROADWAY DESIGN STANDARDS	STANDARD DRAWING
MINOR ARTERIAL STREET SECTION	8



STANDARD DRAWING	ROADWAY DESIGN STANDARDS	
9	MAJOR ARTERIAL STREET SECTION (4 - LANES)	



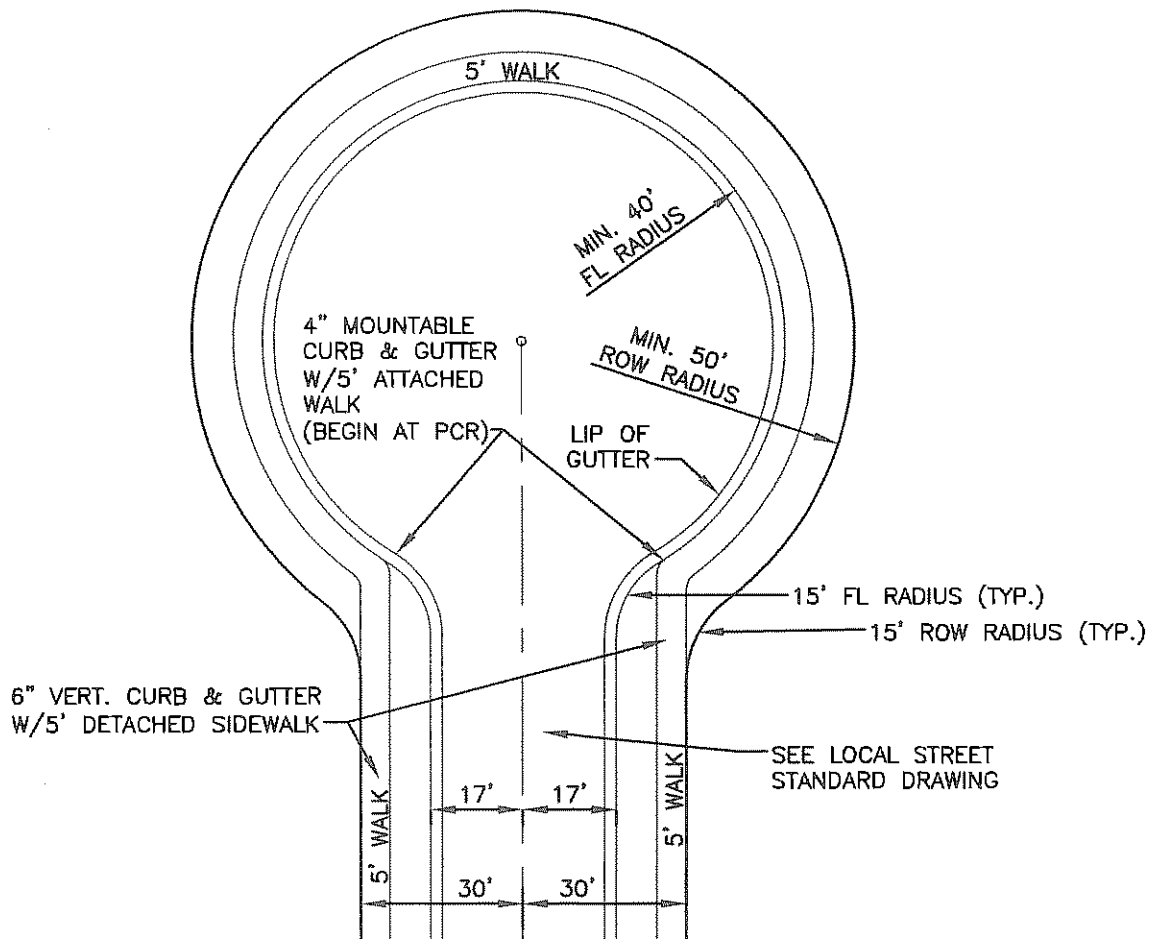
ROADWAY DESIGN STANDARDS

MAJOR ARTERIAL STREET SECTION  
(6 - LANES)

STANDARD DRAWING

10



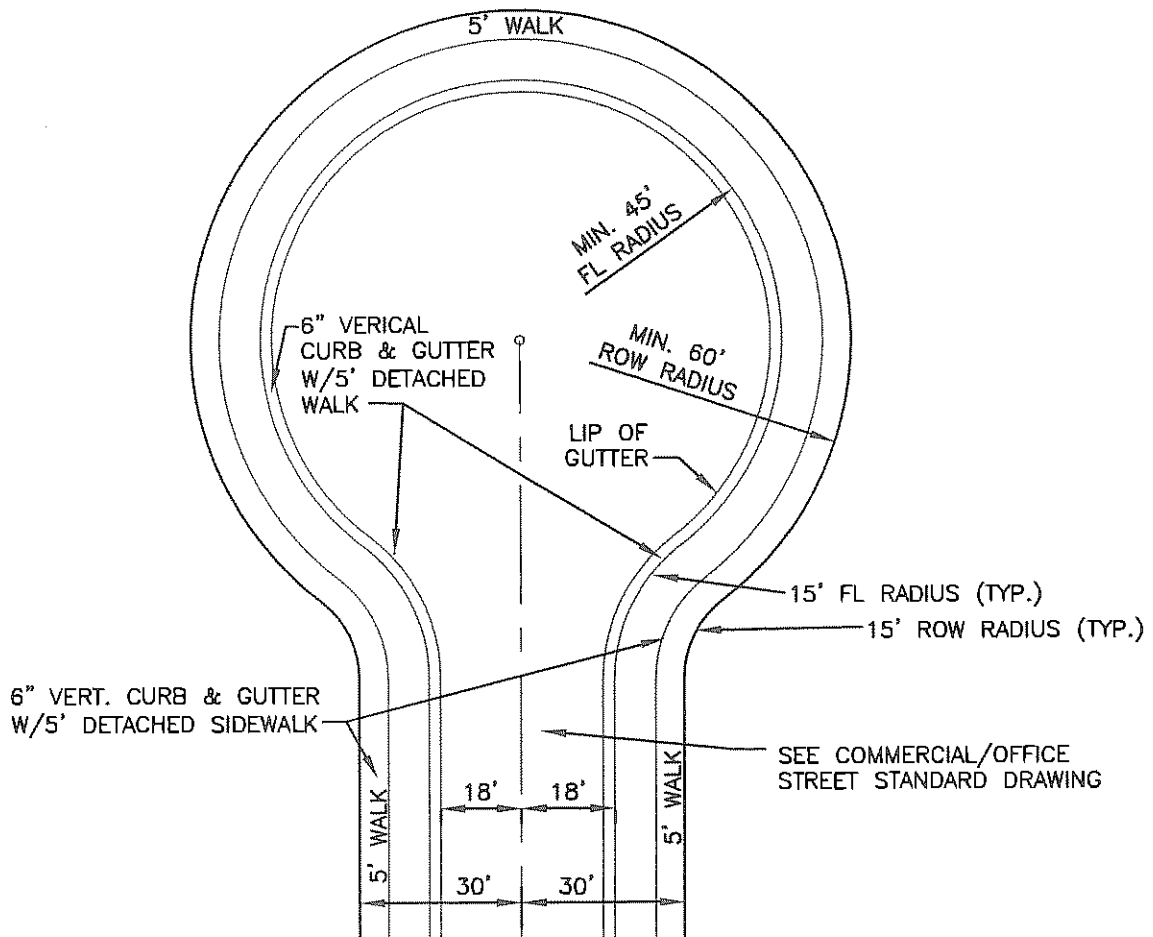


ROADWAY DESIGN STANDARDS

STANDARD DRAWING

LOCAL STREET  
CUL-DE-SAC DETAIL

11-a



IN COMMERCIAL/OFFICE AREAS REQUIREMENTS FOR CUL-DE-SACS SHALL BE BASED ON TURNING TEMPLATES FOR MAXIMUM EXPECTED TRUCK WHEEL BASE LENGTH.

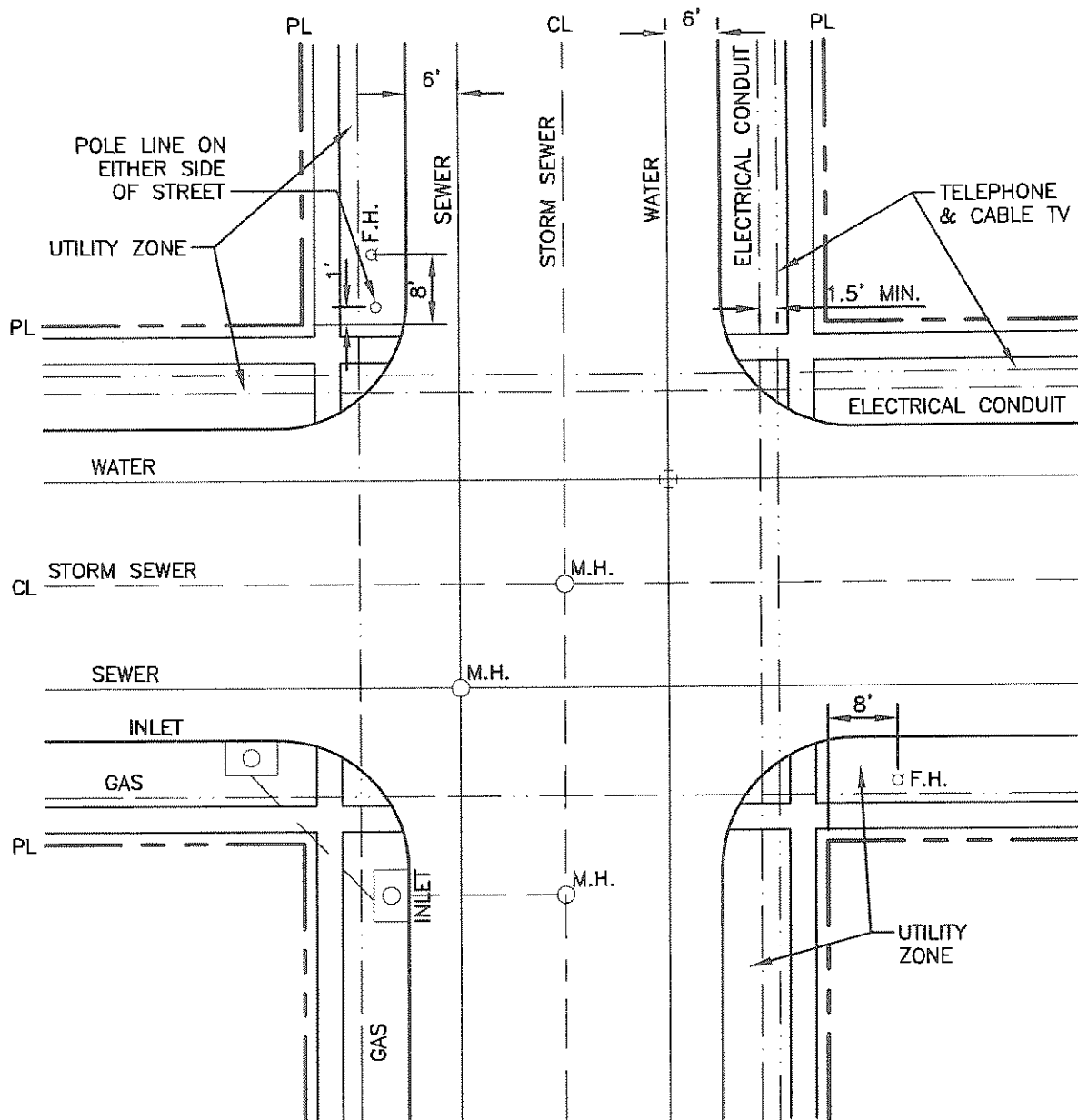


ROADWAY DESIGN STANDARDS

STANDARD DRAWING

COMMERCIAL/OFFICE STREET  
CUL-DE-SAC DETAIL

11-b



NOTE: THIS STANDARD IS A GUIDELINE ONLY AND DEVIATIONS MAY BE ACCEPTABLE WHERE CONDITIONS DICTATE. DIMENSIONS SHOWN ARE DESIRABLE BUT DO NOT GOVERN. THE INTENTION IS TO SHOW THE RELATIVE POSITION OF ALL UTILITIES. THIS DOES NOT PRECLUDE THE USE OF UTILITIES IN EASEMENTS IN OTHER LOCATIONS (IE. BACK LOT LINES). LOCATIONS OF RECYCLED WATER LINES TO BE APPROVED BY TOWN ENGINEER.

#### UTILITY LOCATION - GENERAL

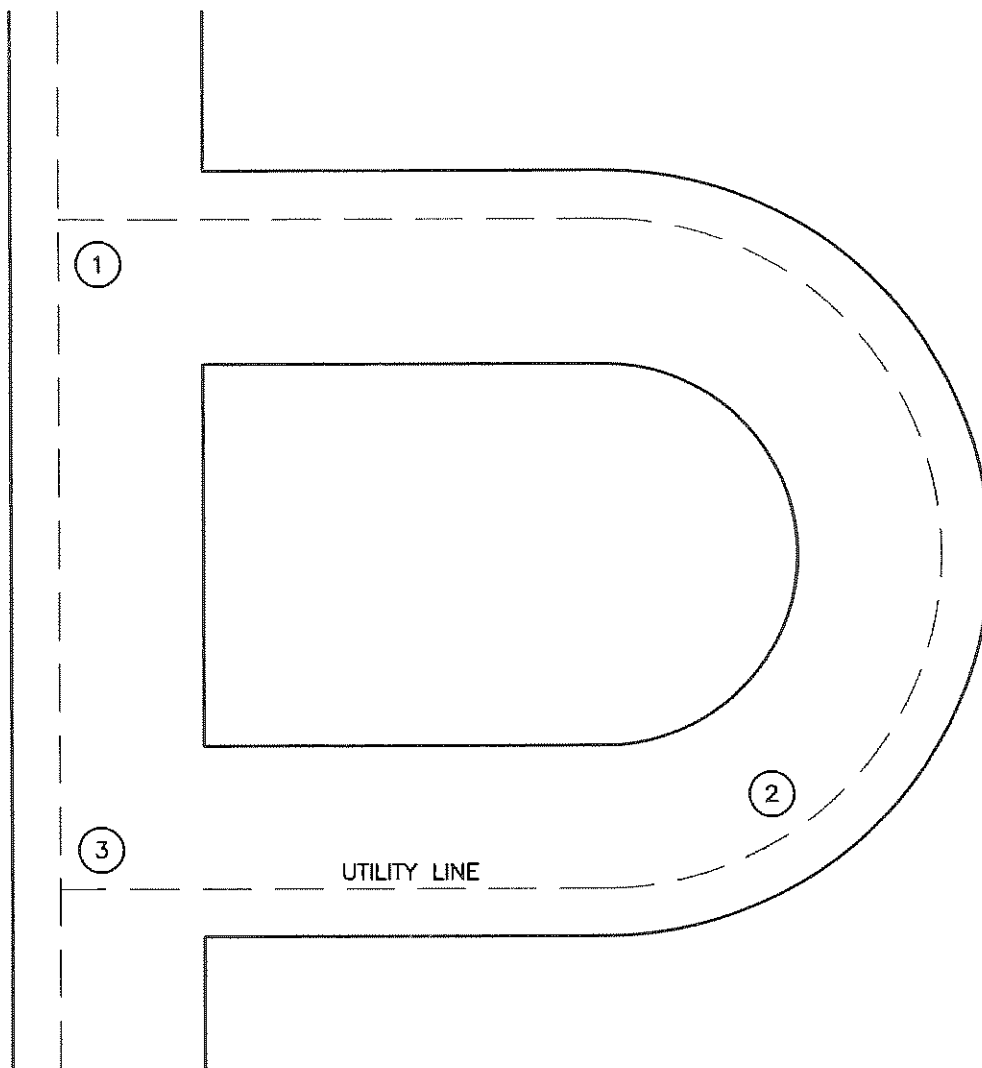


ROADWAY DESIGN STANDARDS

STANDARD DRAWING

UTILITY LINE LOCATIONS

12



EXAMPLE OF A UTILITY RELOCATION TO A NORMAL POSITION AT AN INTERSECTION.

1. CARRY UTILITY AROUND CORNER.
2. STAY ON SAME SIDE OF STREET.
3. RETURN UTILITY TO NORMAL SIDE OF STREET AT INTERSECTION

UTILITY RELOCATION TO A NORMAL POSITION  
AT AN INTERSECTION



ROADWAY DESIGN STANDARDS

STANDARD DRAWING

UTILITY LINE LOCATIONS

13

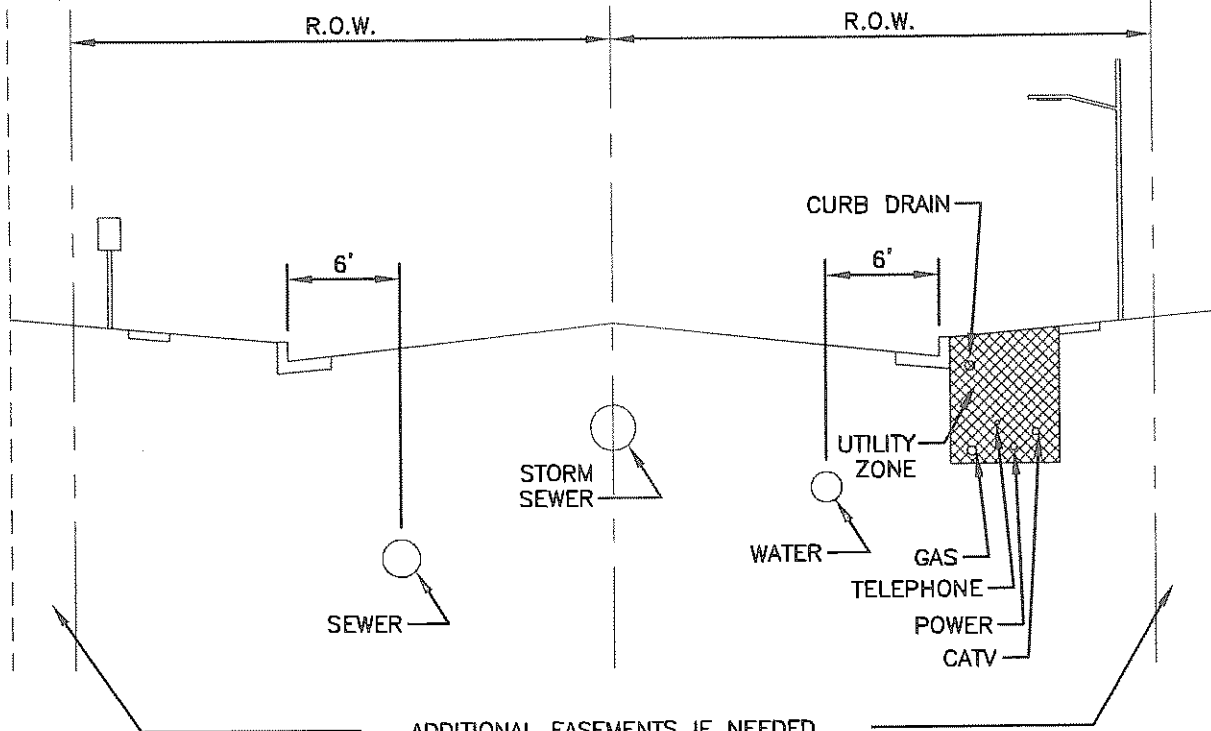
SOUTH OR WEST  
PL

NORTH OR EAST  
PL

CL

R.O.W.

R.O.W.



ADDITIONAL EASEMENTS IF NEEDED  
MINIMUM DEPTHS

STREET LIGHTS	30"
GAS	30"
TELEPHONE	*
ELECTRIC POWER	*
STORM SEWER	40"
SANITARY SEWER	96"
CATV	24"
POTABLE AND RECYCLED	30"
WATER (WITH TRACER TAPED TO PVC, WARNING TAPE 1' ABOVE DIP)	54"
FIBER OPTIC (WITH TRACER WIRE 1' ABOVE THE LINE)	48"
OTHER	30"

\* ELECTRIC AND TELEPHONE LINES PER LATEST  
ADDITION OF NATIONAL ELECTRIC SAFETY CODE

NOTE: THIS STANDARD IS A GUIDELINE ONLY AND DEVIATIONS MAY BE ACCEPTABLE WHERE  
CONDITIONS DICTATE. DIMENSIONS SHOWN ARE DISIRABLE BUT DO NOT GOVERN. THE  
INTENTION IS TO SHOW THE RELATIVE POSITION OF ALL UTILITIES. THIS DOES NOT  
PRECLUDE THE USE OF UTILITIES IN EASEMENTS IN OTHER LOCATION(IE. BACK LOT LINES).

#### UTILITY LOCATIONS - GENERAL (VERTICAL)

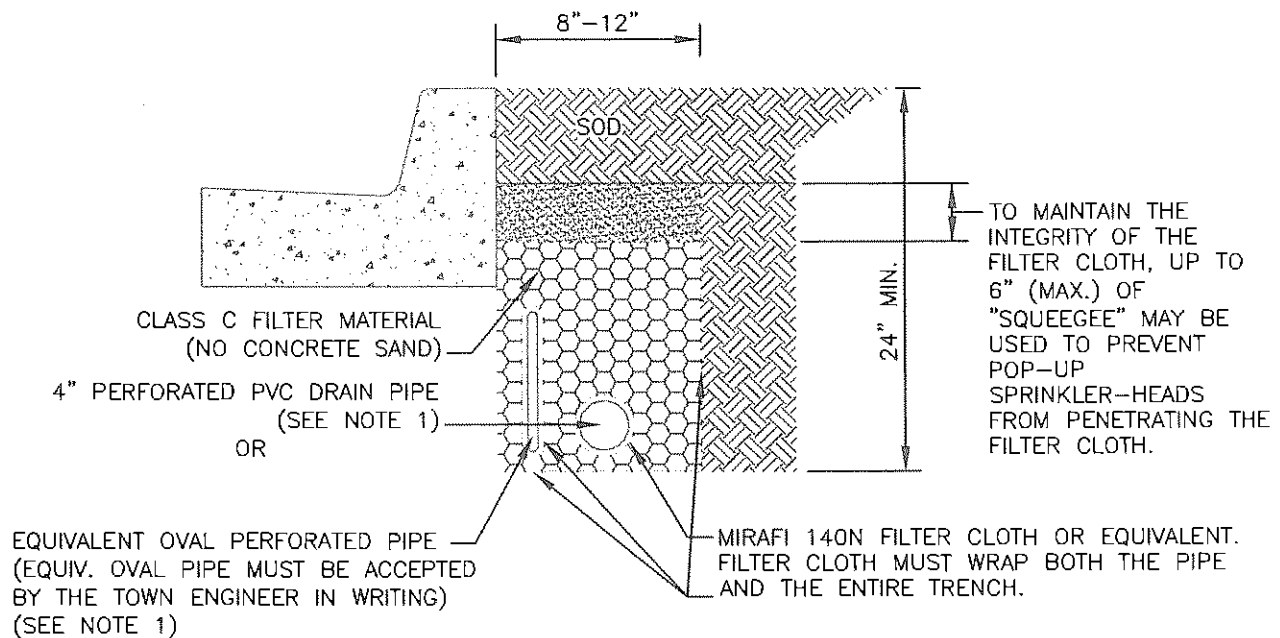


ROADWAY DESIGN STANDARDS

STANDARD DRAWING

UTILITY LINE LOCATIONS

14



### CURB TRENCH DRAIN

#### NOTES:

1. THE 4" (OR EQUIVALENT OVAL) DRAIN PIPE WILL BE CONNECTED TO A STORM DRAINAGE SYSTEM TO CREATE A POSITIVE DRAINAGE OF RUNOFF.

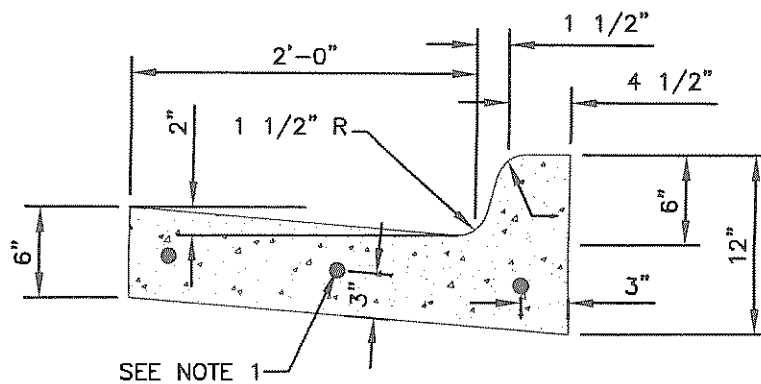


ROADWAY DESIGN STANDARDS

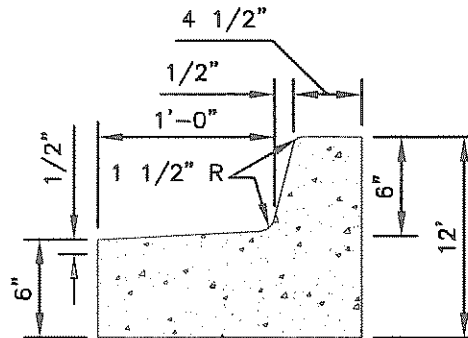
STANDARD DRAWING

CURB DRAIN DETAIL

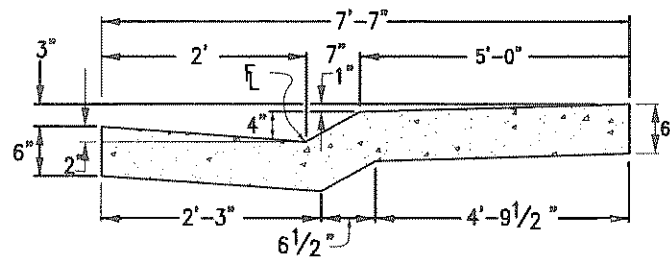
15



VERTICAL CURB & GUTTER



MEDIAN CURB & GUTTER



CURB AND GUTTER TYPE 2

(SECTION MS)

(4" MOUNTABLE WITH SIDEWALK)

**NOTES:**

1. NO. 4 REBAR SHALL BE USED IN ALL CURB RETURNS WITH 25' OR LARGER RADII. THE REBAR SHALL BE USED FROM BEGINNING TO END OF THE CURB RETURN.
2. SUBGRADE UNDER CURB, GUTTER AND SIDEWALK TO BE COMPACTED TO 95% AASHTO T-180.
3. IF A SIDEWALK IS PLACED BEHIND THE CURB BUT IS NOT PLACED MONOLITHICALLY, A SILICONE BASE SEALER MUST BE APPLIED BETWEEN THE SIDEWALK AND THE CURB.
4. CONCRETE TO BE 4,000 psi STRENGTH.

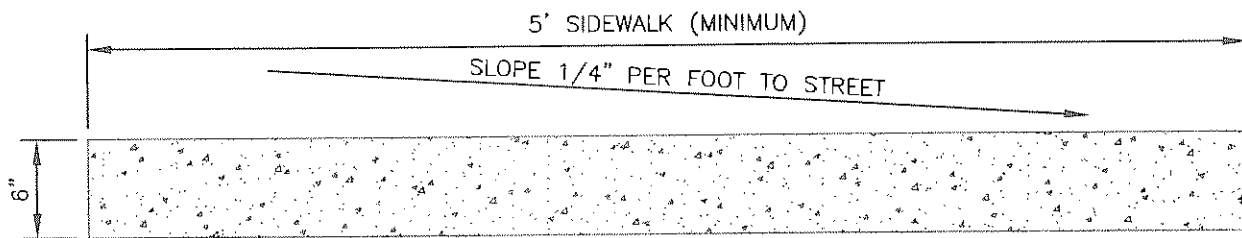


ROADWAY DESIGN STANDARDS

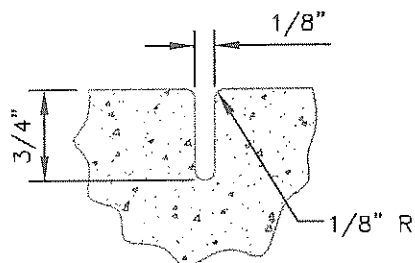
STANDARD DRAWING

CURB, GUTTER AND WALK

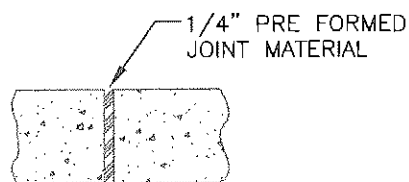
16



STANDARD DETACHED/ATTACHED WALK



CONTRACTION OR  
WEAKENED PLANE JOINT  
(EVERY 5 TO 8 FEET)



EXPANSION JOINT  
(EVERY 30 FEET)

NOTE: CONCRETE TO BE 4,000 psi STRENGTH.



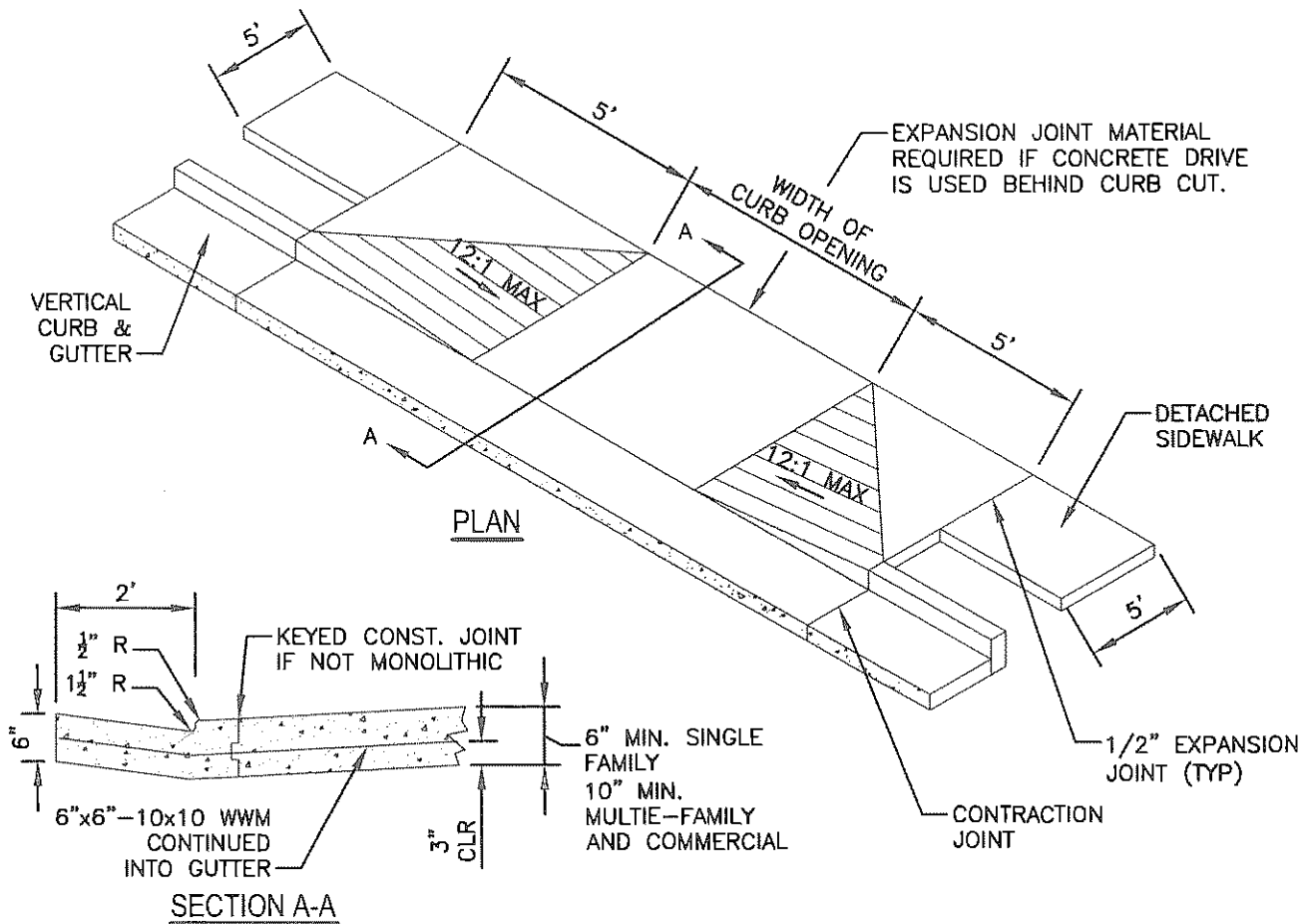
ROADWAY DESIGN STANDARDS

STANDARD DRAWING

SIDEWALK DETAILS

17





#### NOTES:

1. EXTEND BACK OF CURB CUT TO BACK OF SIDEWALK.
2. TOWN ENGINEER SHALL APPROVE LOCATION OF CURB CUT BEFORE CONSTRUCTION.
3. AN ACCESS SHALL BE LIMITED TO RIGHT TURNS ONLY, UNLESS (1) IT HAS THE POTENTIAL FOR SIGNALIZATION, (2) LEFT TURNS WOULD NOT CREATE UNREASONABLE CONGESTION OR SAFETY PROBLEMS AND LOWER THE LEVEL OF SERVICE, AND (3) ALTERNATIVES TO THE LEFT TURNS WOULD NOT CAUSE UNACCEPTABLE TRAFFIC OPERATION AND SAFETY PROBLEMS TO THE GENERAL STREET SYSTEM.
4. CONCRETE TO BE 4,000 psi STRENGTH.

#### WIDTH OF CURB OPENINGS

	RESIDENTIAL SF	MF	COMMERCIAL	SERVICE STATION	INDUSTRIAL
MINOR COLLECTOR	NA	30-35	40-50	40-50	40-50
LOCAL	8-24	30-35	40-50	40-50	40-50

CURB OPENINGS 30' OR MORE MUST BE CONSTRUCTED WITH RADIUS CURB RETURNS.

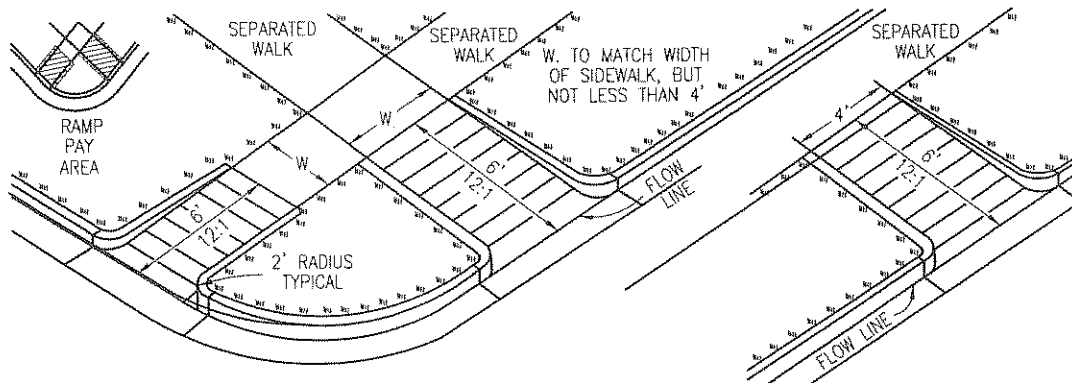


ROADWAY DESIGN STANDARDS

STANDARD DRAWING

DRIVEWAY CUT

18



TYPE 1

TYPE 1 — FOR USE IN AREAS WHERE THE SIDEWALK IS SET BACK FROM THE STREET, AND WHEELCHAIR ACCESS FROM THE SIDE OF THE RAMP IS NOT LIKELY TO OCCUR BECAUSE THE APPROACH AREA IS COVERED BY LAWN OR GRAVEL, OR AN OBSTRUCTION IS PRESENT. TYPE 1 CAN BE USED ANYWHERE IN THE BLOCK.

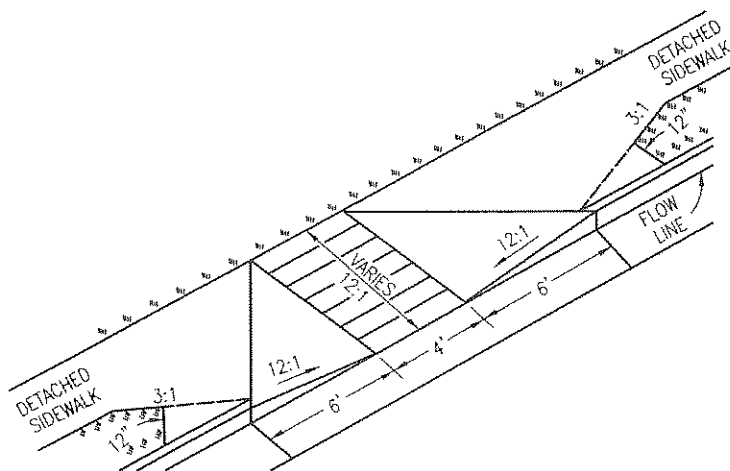


ROADWAY DESIGN STANDARDS

STANDARD DRAWING

TYPE 1 HANDICAP RAMP

19



TYPE 3

TYPE 3 — RAMP IS FOR USE WHERE THE SIDEWALK EXTENDS TO THE CURB OR CAN BE EASILY TRANSITIONED TO PERMIT WHEELCHAIR ACCESS TO THE RAMP FROM THE SIDE. TYPE 3 CAN BE USED ANYWHERE IN THE BLOCK, AS WELL AS AT INTERSECTIONS.

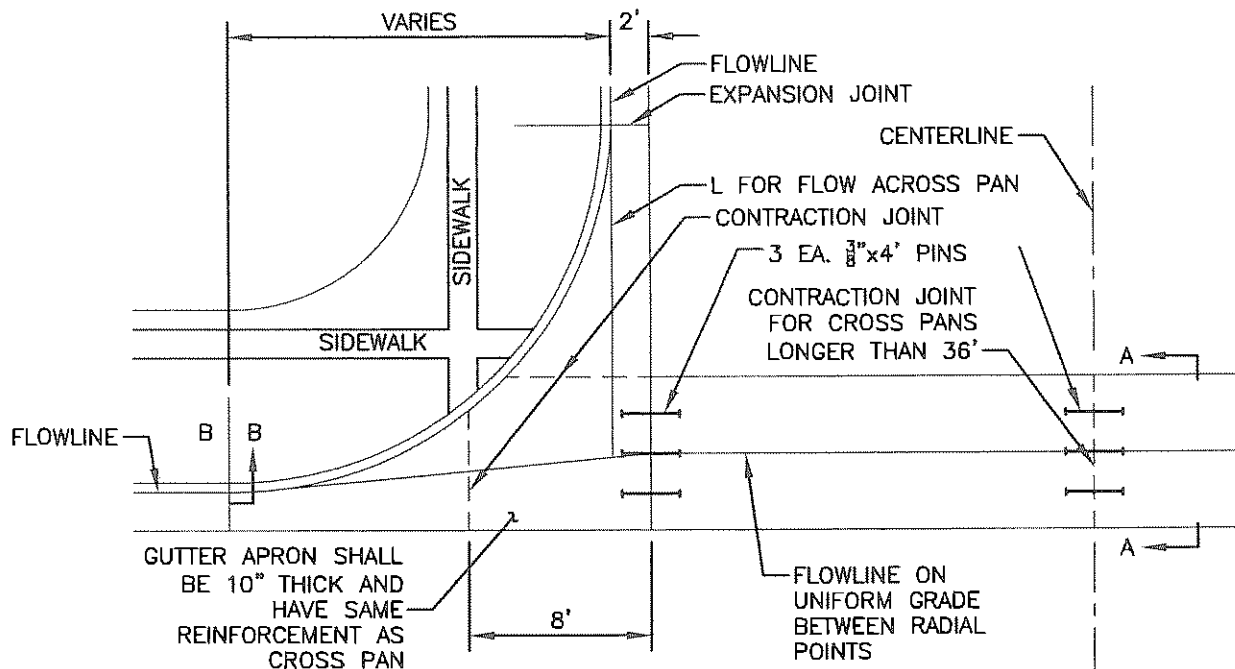


ROADWAY DESIGN STANDARDS

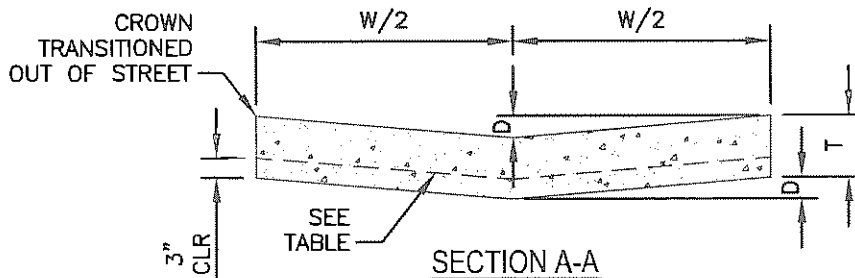
STANDARD DRAWING

TYPE 3 HANDICAP RAMP

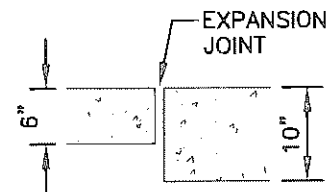
20



PLAN



SECTION A-A



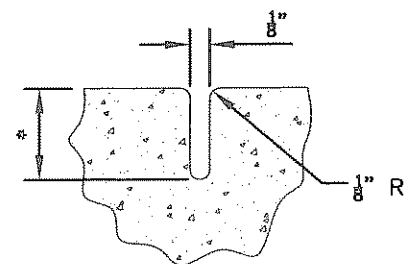
SECTION B-B

NOTE: CONCRETE TO BE 4,000 psi STRENGTH.

WIDTH (W)	DEPTH (D)	THICKNESS (T)
8'	2"	10"
10'	2 1/2"	10"

USE 10' PAN  
WHEN PARALLEL  
TO ARTERIALS AND  
COLLECTORS

PAN LENGTH	WIRE MESH CALLED FOR	REPLACE WITH REBAR HAVING END AREA OF
36'	6X6-4,4	0.10 SQ. IN. PER FT. (#4@18" E.W.)
46'	6X6-2,2	0.13 SQ. IN. PER FT. (#4@18" E.W.)
64'	6X6-0,0	0.20 SQ. IN. PER FT. (#4@12" E.W.)
84'	(2)6X6-2,2	0.26 SQ. IN. PER FT. (#4@ 9" E.W.)



\* 1/4" IF TEMPLATES ARE NOT USED

CONTRACTION OR  
WEAKENED PLANE  
JOINT



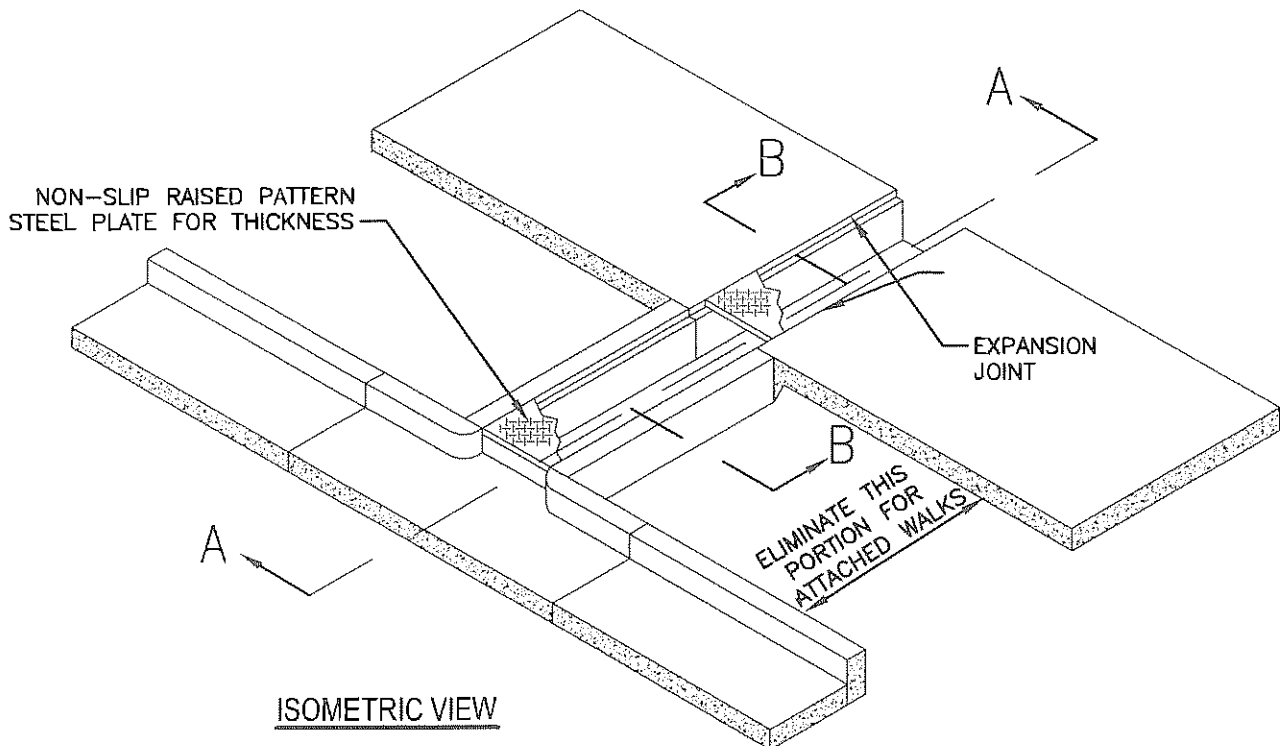
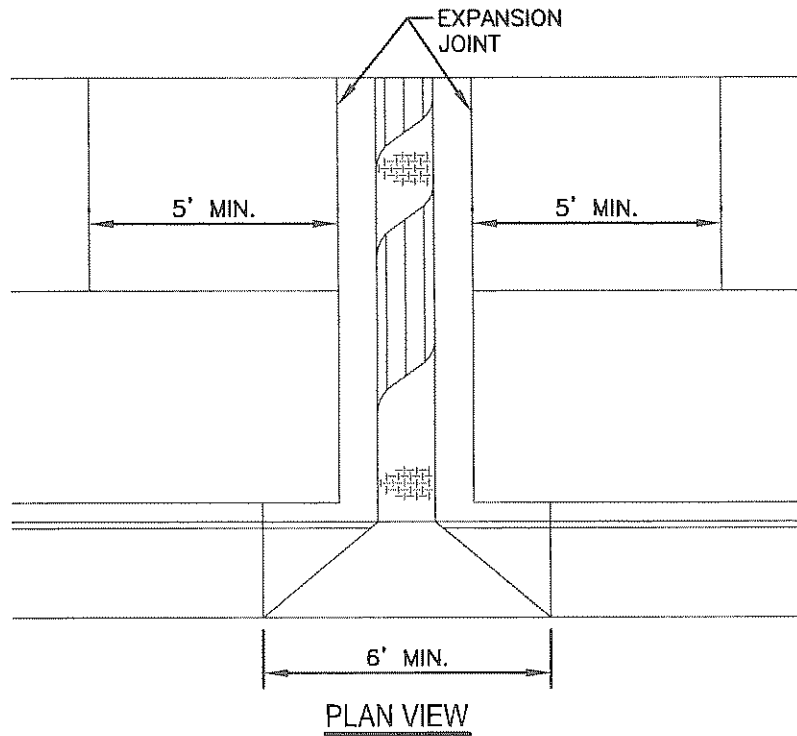
ROADWAY DESIGN STANDARDS

STANDARD DRAWING

CROSS PAN

21

NOTE: CHASE NOT PERMITTED IN 4" CURB SECTION UNLESS TRANSITIONED INTO 6" VERTICAL OR OTHERWISE APPROVED BY THE TOWN ENGINEER.

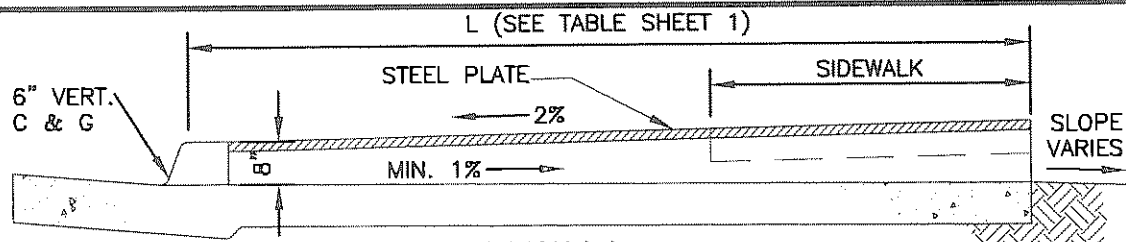


ROADWAY DESIGN STANDARDS

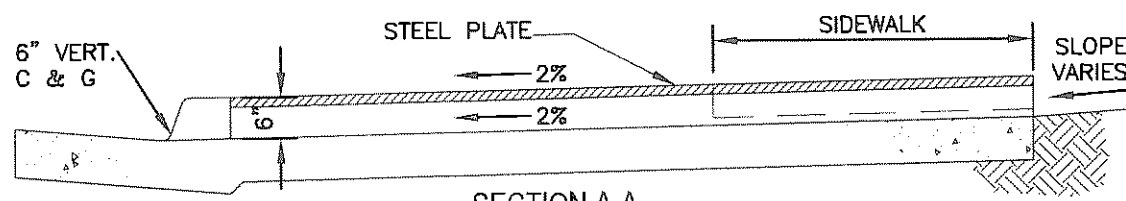
STANDARD DRAWING

SIDEWALK CHASE  
DETACHED SIDEWALK

22



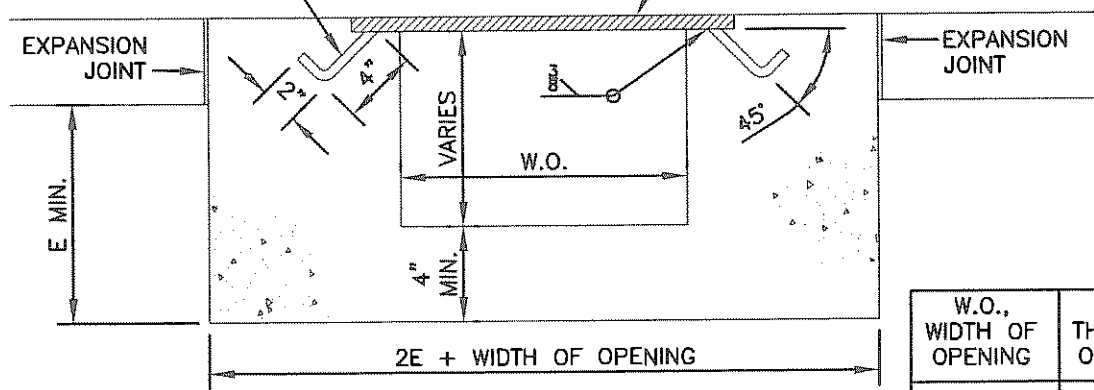
**SECTION A-A**  
**FLOW FROM GUTTER**



**SECTION A-A**  
**FLOW TO GUTTER**

NO. 3 REBAR, 6" LONG,  
WELDED TO PLATE @ 18" OC  
EACH SIDE (1/2" ANCHOR BOLT  
MAY BE USED.)

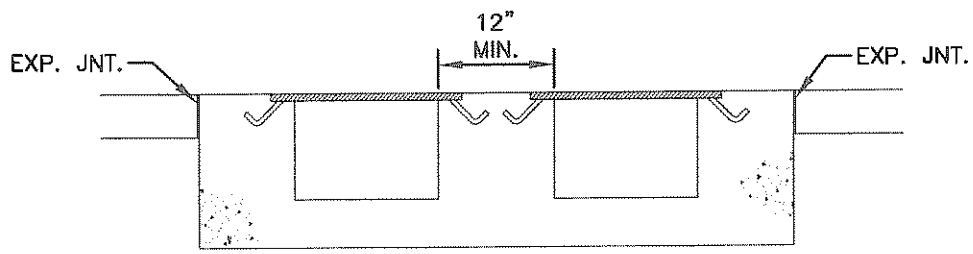
NON-SLIP RAISED PATTERN  
STEEL PLATE. FOR THICKNESS.  
T.P., SEE CHART.



E = 8" WHEN FLOW IS FROM GUTTER.  
E = 6" WHEN FLOW IS TO GUTTER.

W.O., WIDTH OF OPENING	T.P., THICKNESS OF PLATE
12"	1/2"
12-18"	9/16"

**SECTION B-B**



**MULTIPLE CHASE**  
**WHEN OPENINGS ARE LARGER THAN 18"**



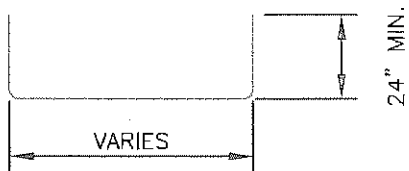
ROADWAY DESIGN STANDARDS

SIDEWALK CHASE  
DETACHED SIDEWALK

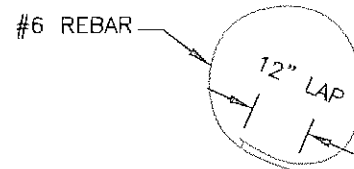
STANDARD DRAWING

23

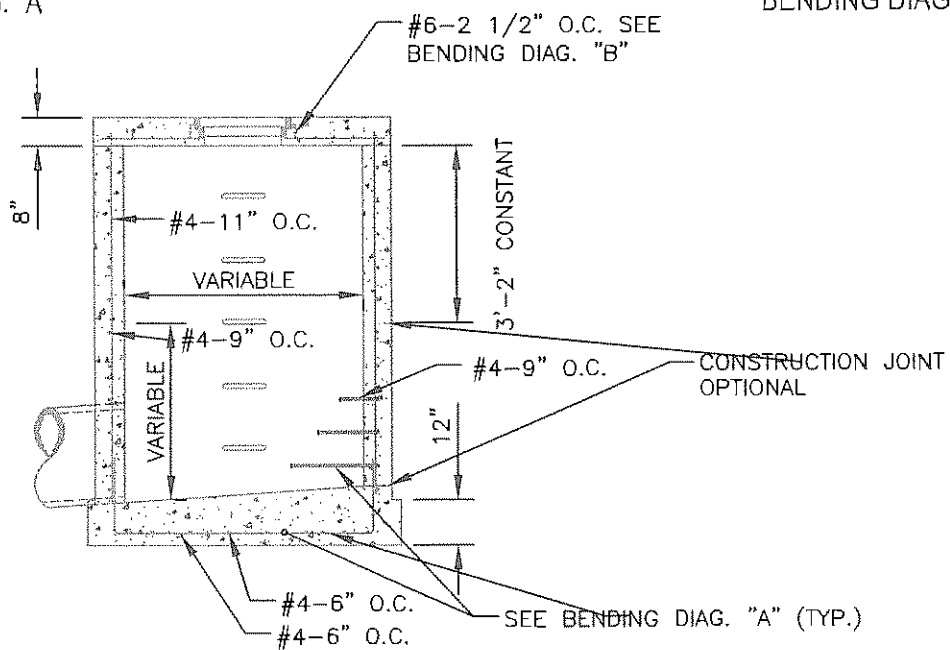




BENDING DIAG. "A"



BENDING DIAG. "B"



SECTION A-A  
REGULAR INLET  
NOT TO SCALE

NOTE:  
ALL CONSTRUCTION JOINTS  
SHALL HAVE A 2"X4" KEYWAY



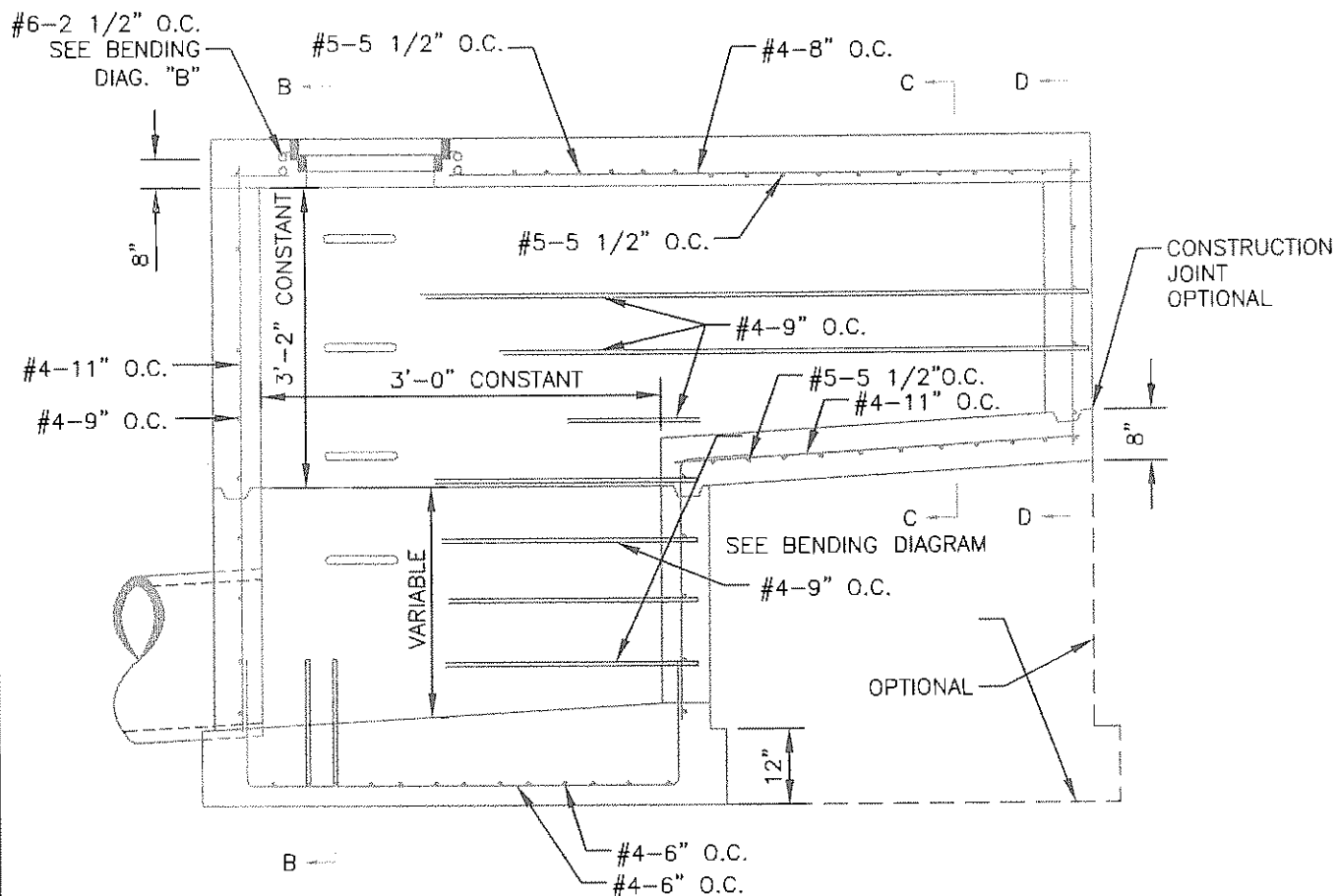
ROADWAY DESIGN STANDARDS

STANDARD DRAWING

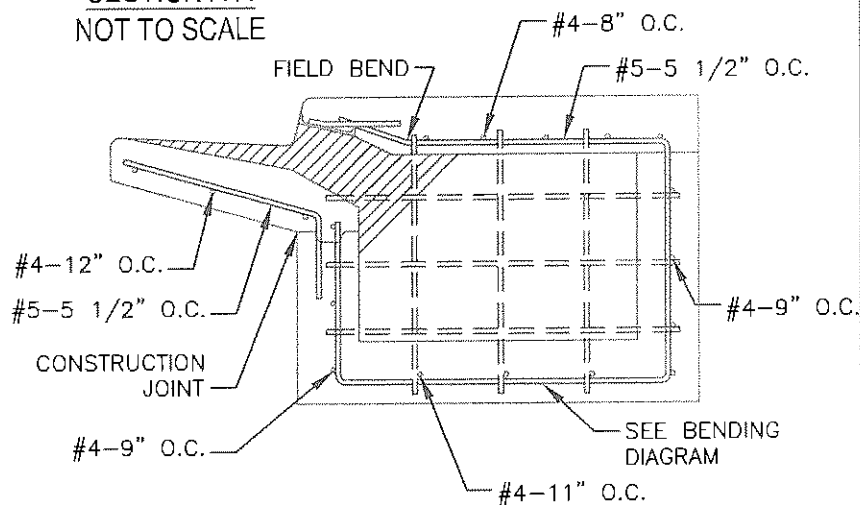
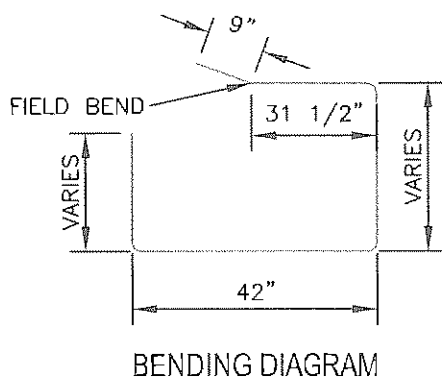
CURB OPENING INLET  
(TYPE R MODIFIED)

25





SECTION A-A  
NOT TO SCALE



SECTION C-C & D-D  
(DASHED BARS ARE IN SEC. D-D)



ROADWAY DESIGN STANDARDS

CURB OPENING INLET  
(TYPE R MODIFIED)

STANDARD DRAWING

26



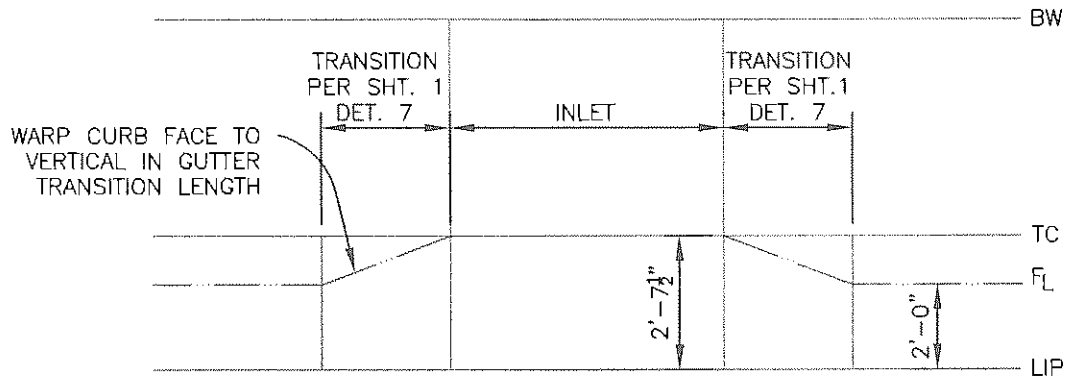
ALL #5 AND LARGER REBAR SHALL BE GRADE 60.



CURB OPENING INLET  
(TYPE R MODIFIED)

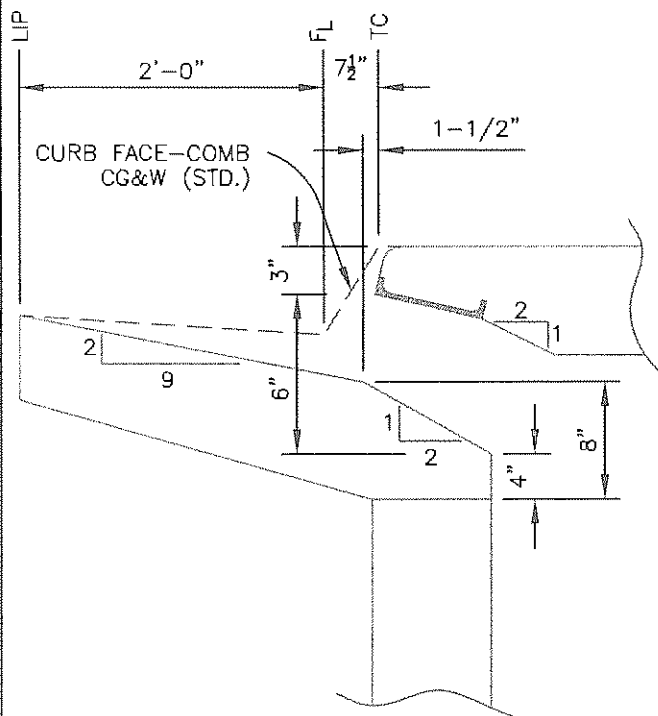
# STANDARD DRAWING

27

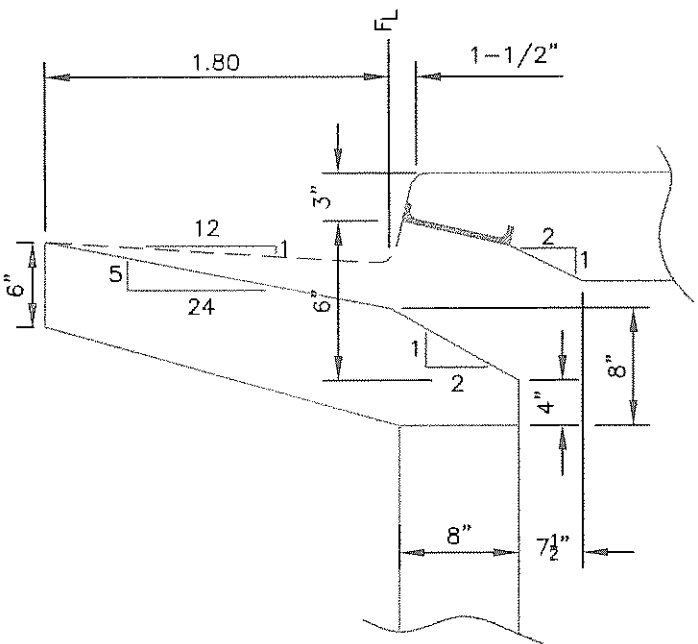


PLAN

TRANSITION COMBINATION CURB, GUTTER, & WALK TO CURB OPENING INLET



THROAT CONFIGURATION DETAIL  
CURB OPENING INLET WITH COMBINATION  
CURB, GUTTER, & WALK



THROAT CONFIGURATION DETAIL  
CURB OPENING INLET WITH  
VERTICAL CURB & GUTTER

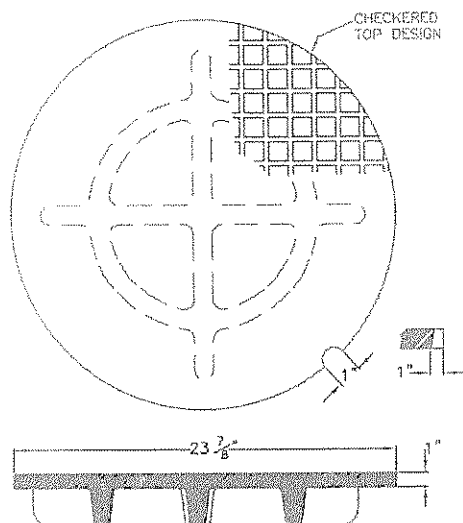


ROADWAY DESIGN STANDARDS

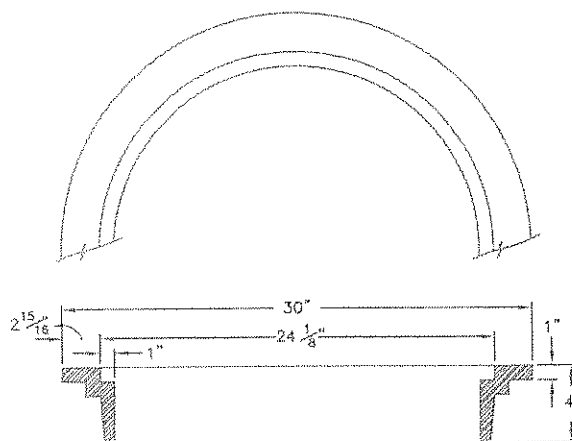
STANDARD DRAWING

CURB OPENING INLET  
(TYPE R MODIFIED)

28



TYPICAL MANHOLE COVER



TYPICAL MANHOLE RING

APPROXIMATE WEIGHTS: COVER = 125 LBS.  
RING = 135 LBS.  
TOTAL = 260 LBS.

### GENERAL NOTES

ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS APPLICABLE TO THE PROJECT.

ALL CONCRETE SHALL BE CLASS A OR B.

CONCRETE WALLS SHALL BE FORMED ON BOTH SIDES AND SHALL BE 8" THICK.

INLET STEPS SHALL BE AS SHOWN ON THE APPLICABLE DIVISION "M" STANDARDS.

CURB FACE ASSEMBLY SHALL BE GALVANIZED AFTER WELDING.

EXPOSED CONCRETE CORNERS SHALL BE BEVELED TO A 1 1/2" FACE. CURB AND GUTTER CORNERS SHALL BE FINISHED TO MATCH THE EXISTING CURB AND GUTTER BEYOND THE TRANSITION GUTTER.

ALL REINFORCING BARS SHALL BE TAGGED WITH BAR DESIGNATION AND STATION NUMBER.

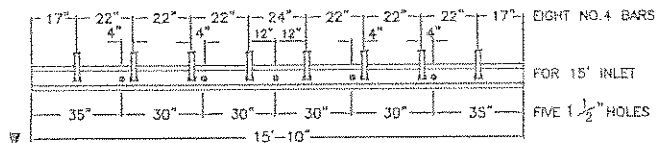
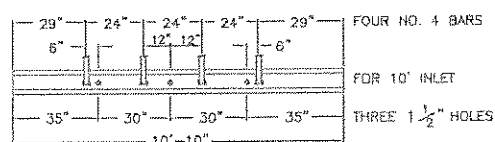
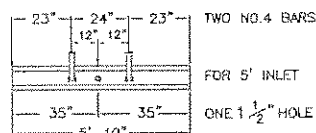
REINFORCING BARS SHALL BE DEFORMED AND SHALL BE OF INTERMEDIATE GRADE STEEL.

DIMENSIONS AND WEIGHTS OF TYPICAL MANHOLE RING AND COVER ARE NOMINAL.

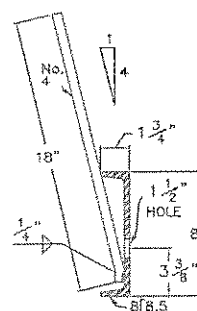
ALL BARS SHALL BE A MINIMUM 2" CLEAR.

SINCE PIPE ENTRIES INTO THE INLET ARE VARIABLE, THE DIMENSIONS SHOWN ARE TYPICAL. ACTUAL DIMENSIONS AND QUANTITIES FOR CONCRETE AND REINFORCEMENT SHALL BE AS REQUIRED IN THE WORK. QUANTITIES INCLUDE VOLUMES OCCUPIED BY PIPES.

STRUCTURAL STEEL SHALL BE GALVANIZED AND SHALL CONFORM TO THE REQUIREMENTS OF SECTION 509.



CHANNEL LAYOUT DETAILS



TYPICAL SECTION AT HOLE



ROADWAY DESIGN STANDARDS

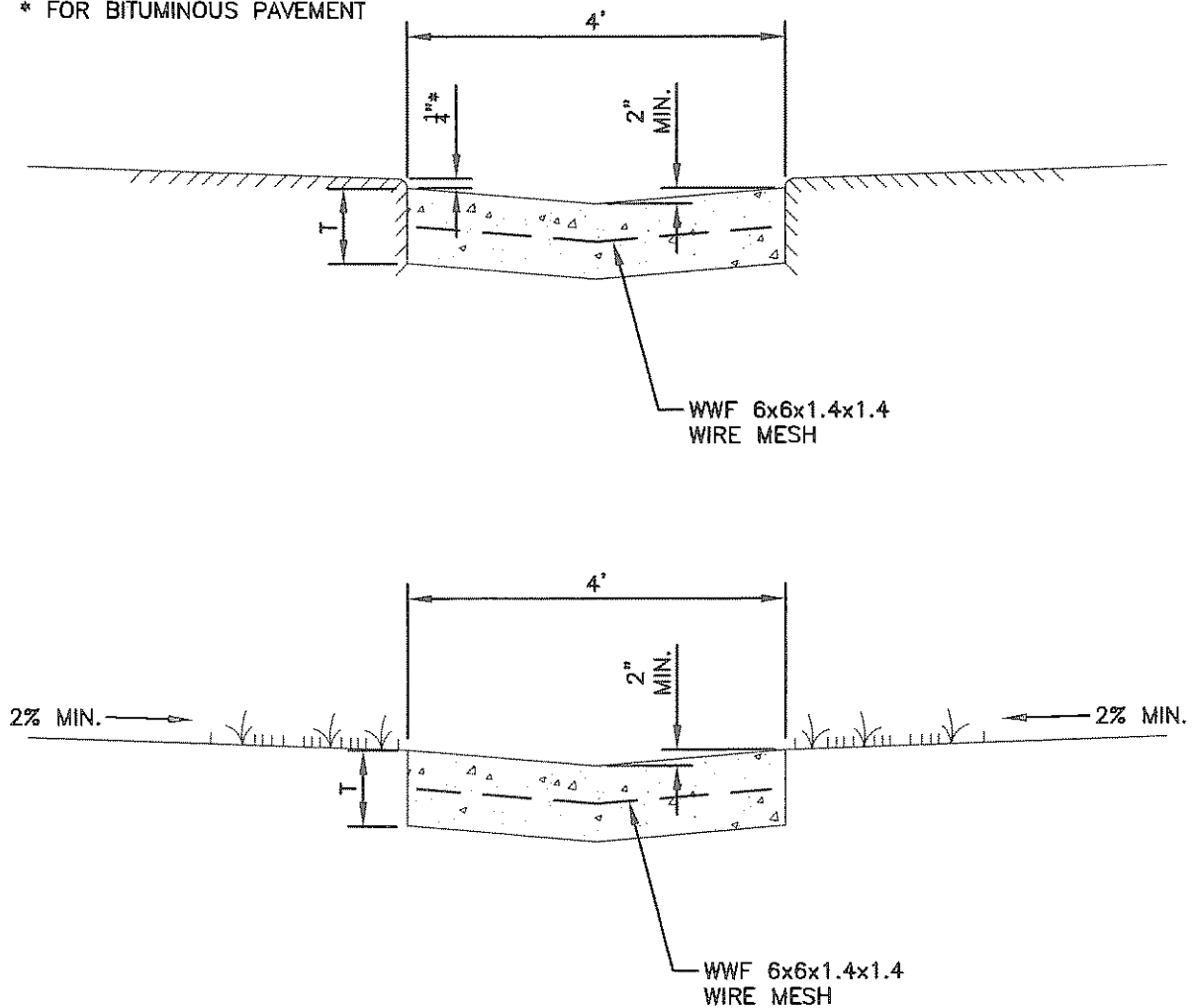
STANDARD DRAWING

CURB OPENING INLET  
(TYPE R MODIFIED)

29

T IS 4" IN OPEN AREAS (GRASS)  
 T IS 8" IN PARKING AREAS, FIRE LANE ALLEYS AND DRIVEWAYS

\* FOR BITUMINOUS PAVEMENT



NOTE: CONCRETE TO BE 4,000 psi STRENGTH.



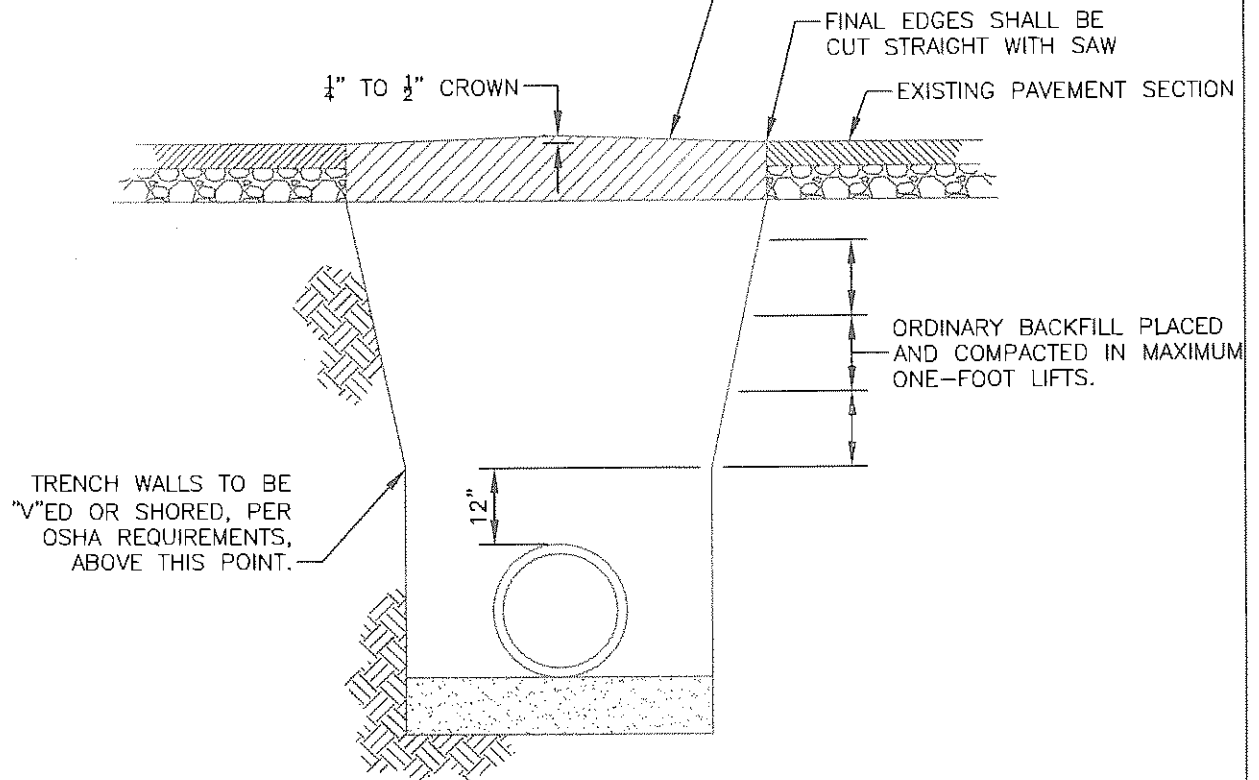
ROADWAY DESIGN STANDARDS

STANDARD DRAWING

VALLEY GUTTER

30

FULL DEPTH ASPHALT TRENCH PATCH COMPACTED PER TOWN  
OF SUPERIOR ROADWAY DESIGN CRITERIA.



SOIL CLASSIFICATION (AASHTO M145)	MIN. RELATIVE COMPACTION	STANDARD
A-1, A-3, A-2-4, A-2-5	95%	AASHTO T180 *
ALL OTHERS	95%	AASHTO T99 **

\* ASTM D1557

\*\* ASTM D698



ROADWAY DESIGN STANDARDS

TRENCH PATCHING

STANDARD DRAWING

31

MINIMUM ASPHALT PATCH THICKNESS				
ZONING				
STREET CLASSIFICATION	INDUSTRIAL		ALL OTHER	
	THICKNESS	LIFTS	THICKNESS	LIFTS
ARTERIAL	10 ½"	4	9"	3
COLLECTOR	9"	3	7 ½"	3
LOCAL	8"	3	6 ½"	3

MAXIMUM LIFT DEPTH – 3"

MINIMUM LIFT DEPTH – 1 ½"

THICKNESS OF EACH LIFT BELOW THE TOP SHALL NOT VARY MORE THAN 3/8"  
TOP LIFT SHALL BE GRADE Sx HOT BITUMINOUS PAVEMENT

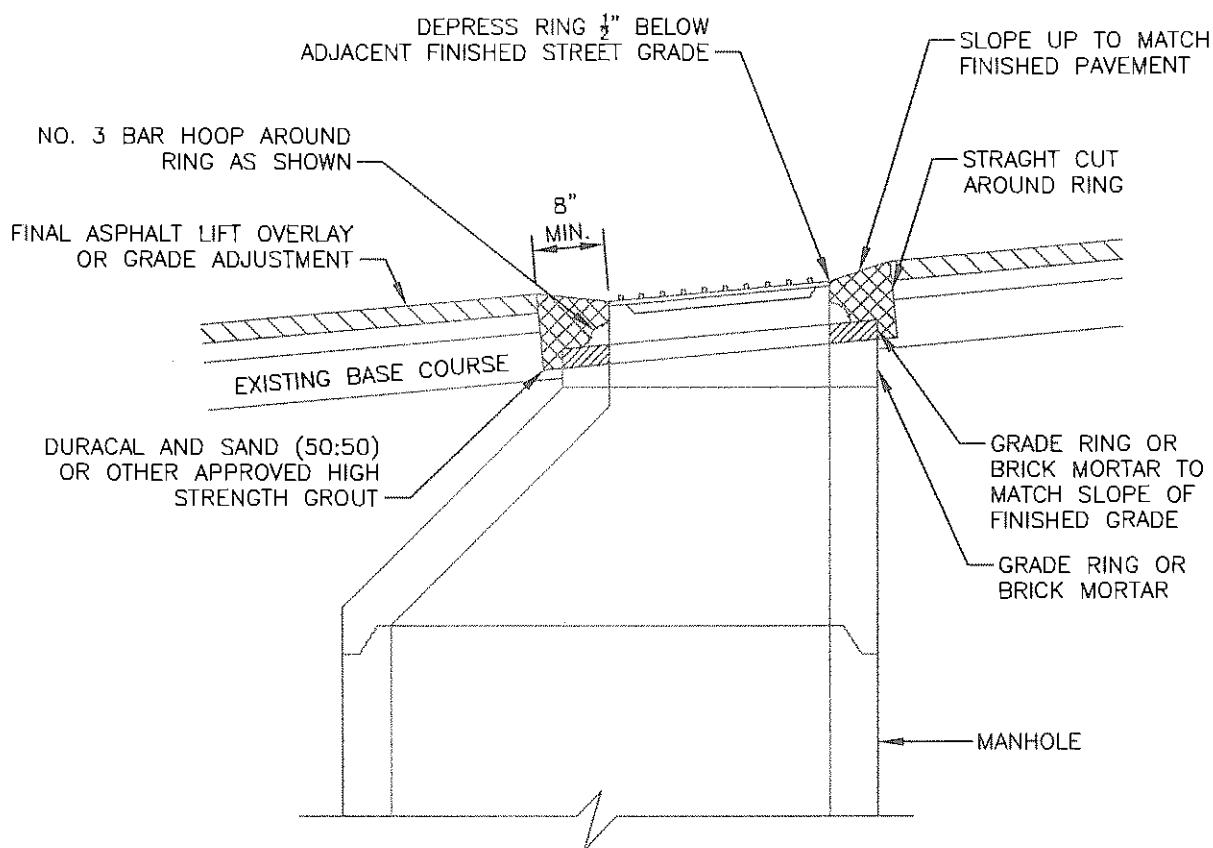


ROADWAY DESIGN STANDARDS

STANDARD DRAWING

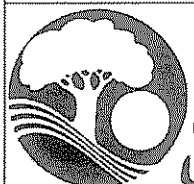
TRENCH PATCHING

32



NOTES:

1. ADEQUATE BARRICADES SHALL BE PLACED AND MAINTAINED UNTIL THE COLLAR ATTAINS A COMPRESSIVE STRENGTH OF 3,000 PSI.
2. DURACAL GROUT SHALL BE A MIXTURE OF 100 LBS. DURACAL, 26 LBS. WATER (3.12 GAL.), AND 100 LBS. OF SAND CONFORMING TO ASTM C-33.



*Town of  
Superior*

ROADWAY DESIGN STANDARDS

MANHOLE RIM AND COVER ADJUSTMENT

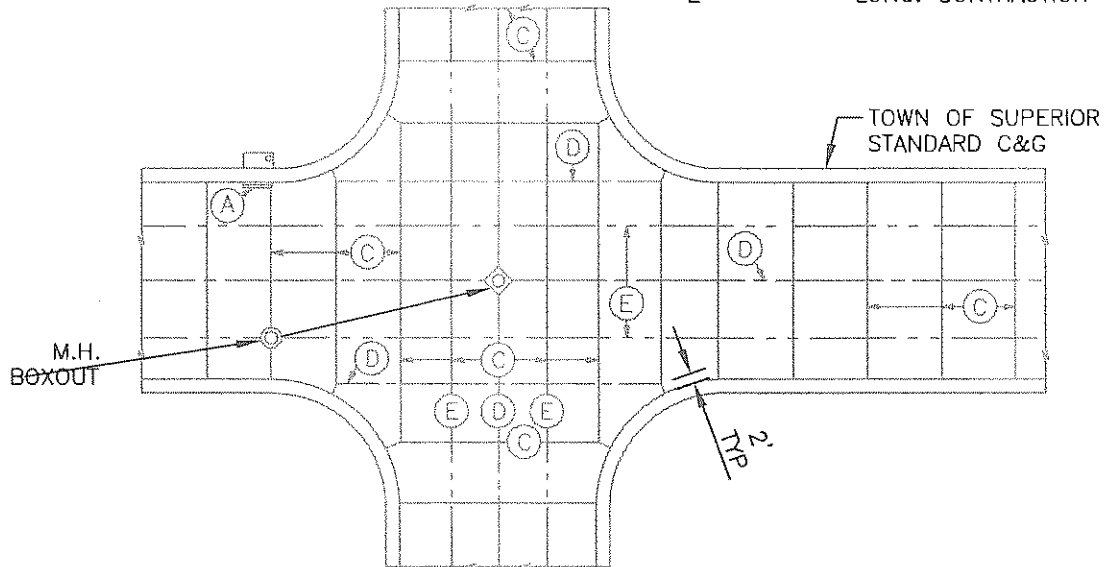
STANDARD DRAWING

33

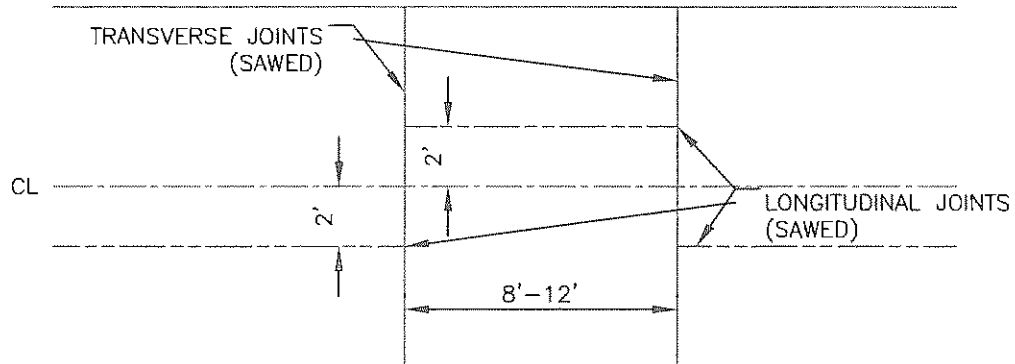


# JOINT LEGEND

- A ——— EXPANSION (AT INLET ONLY)
- C ——— TRANSVERSE CONTRACTION
- D ——— LONG. CONSTRUCTION
- E ——— LONG. CONTRACTION



TYPICAL JOINT LAYOUT  
FOR STREET CROSS SECTION



TYPICAL JOINT LAYOUT  
FOR ALLEY CROSS SECTION

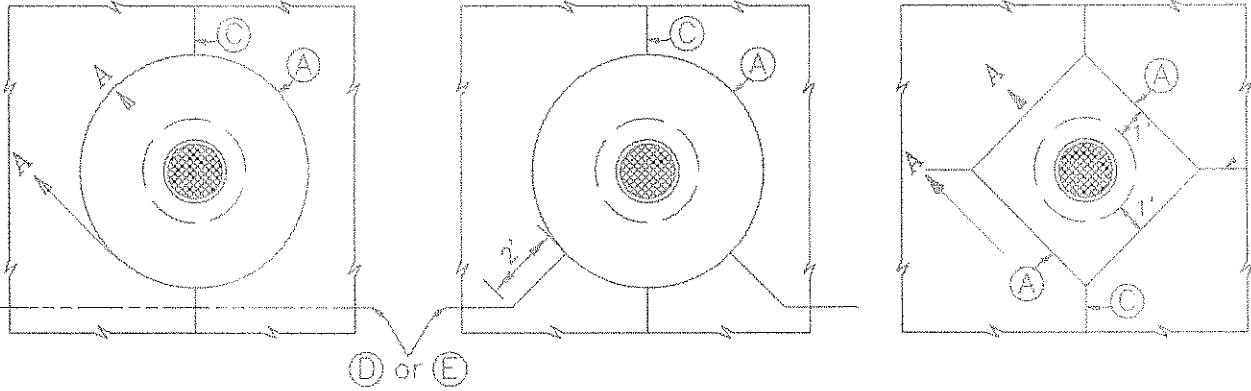


ROADWAY DESIGN STANDARDS

STANDARD DRAWING

CONCRETE PAVEMENT JOINT

34



## MANHOLE BOXOUT

### NOTES:

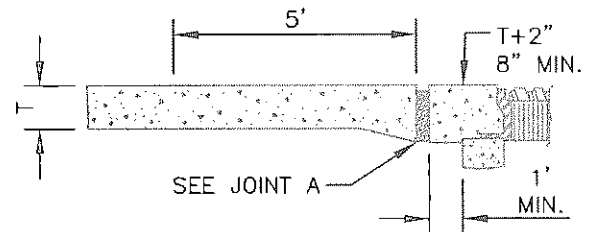
ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS APPLICABLE TO THE PROJECT.

# — BARS SHALL BE DEFORMED, REINFORCING BARS, INTERMEDIATE GRADE:  
#4 WHEN  $T=8"$ , #5 WHEN  $T>8"$

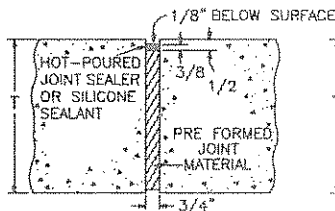
T — SEE PLANS FOR DIMENSION T. THICKNESS OF CONCRETE PAVEMENT THE COST OF ALL BARS AND JOINT MATERIAL IS TO BE INCLUDED IN THE BID PRICE FOR CONCRETE PAVEMENT.

CONCRETE PAVEMENT SHALL RECEIVE A TRANSVERSE TING FINISH UNLESS ANOTHER TYPE FINISH IS PERMITTED.

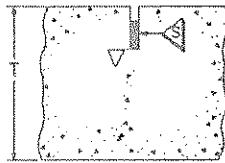
▽ — THICKNESS AND TYPE OF PLASTIC PARTING STRIP SHALL BE AS SHOWN HEREON OR APPROVED. PLASTIC STRIP SHALL BE INSTALLED AT THE TIME OF PLACING OF THE CONCRETE AND SHALL BE LEFT IN PLACE. PLASTIC STRIP SHALL BE  $\frac{1}{8}"$  BELOW THE SURFACE AND VERTICAL TO THE CONCRETE PAVEMENT BEFORE FINISHING AND TEXTURING. SPLICING SHALL BE WITH ENDS BUTTED. CONSTRUCTION JOINT GROOVES SHALL BE ACCOMPLISHED BY FORMING SAWING OR AS DIRECTED, TO THE DIMENSIONS SHOWN.



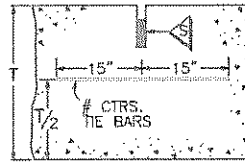
SECTION A-A



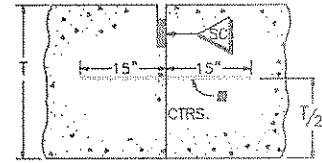
(A)  
**EXPANSION JOINT**



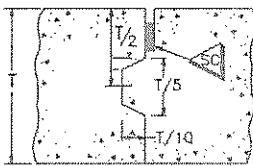
(C)  
**TRANSVERSE  
CONTRACTION JOINT**  
(TRANSVERSE WEAKENED  
PLANE JOINT)



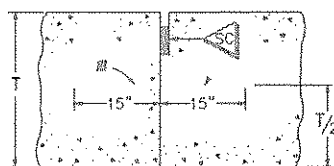
(E)  
**LONGITUDINAL  
CONTRACTION JOINT**  
(LONGITUDINAL WEAKENED  
PLANE JOINT)



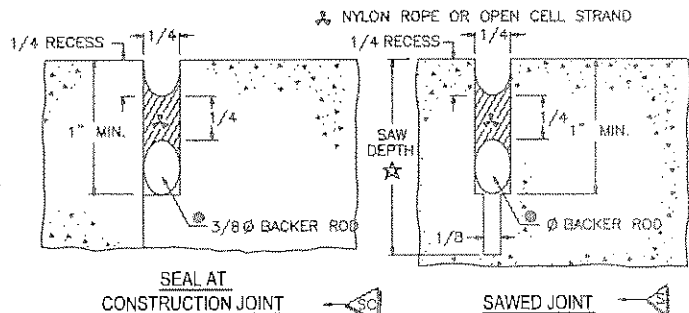
(T)  
**TRANSVERSE  
CONSTRUCTION JOINT**



(D)  
**LONGITUDINAL  
CONSTRUCTION JOINT**



(L)  
**LONGITUDINAL  
CONSTRUCTION JOINT**



☆ LONGITUDINAL JOINT, T/3  
TRANSVERSE JOINT, T/4



ROADWAY DESIGN STANDARDS

STANDARD DRAWING

CONCRETE PAVEMENT JOINT

35

GENERAL NOTES:

THE TYPICAL JOINT LAYOUT SHOWN IS INTENDED TO BE USED AS A STANDARD FOR THE JOINT LAYOUT FOR THE PROJECT. IF THE CONTRACTOR PROPOSES VARIATIONS FROM THIS STANDARD OR THE PROJECT HAS UNUSUAL OR IRREGULAR CONDITIONS NOT COVERED HEREIN, HE SHALL PREPARE A PAVEMENT JOINT LAYOUT FOR APPROVAL BY THE ENGINEER.

LONGITUDINAL JOINTS SHALL COINCIDE WITH LANE MARKINGS, IF POSSIBLE, AND HAVE MINIMUM SPACE OF 12.5'. THE LONGITUDINAL JOINT CLOSEST TO THE CURB SHALL BE TIED IF THERE IS NO BACKFILL BEHIND THE CURB.

PLACE TRANSVERSE JOINTS PERPENDICULAR TO THE CENTERLINE OF PAVEMENT AND EXTEND THROUGH THE CURB AND GUTTER OR CURB-GUTTER AND WALK (COMBINATION).

IMMEDIATELY AFTER SAWING, JOINTS SHALL BE CLEANED OF CEMENT SLURRY WITH A PRESSURIZED WATER JET OR OTHER ACCEPTABLE METHOD. JOINTS SHALL ALSO BE CLEANED WITH COMPRESSED AIR JUST AHEAD (100' OR LESS) OF PLACING BACKER ROD AND POURED JOINT MATERIAL. THE ENGINEER MAY REQUIRE OTHER METHODS IF NECESSARY TO CLEAN JOINT.

PLACE  $\frac{1}{2}$ " MINIMUM EXPANSION JOINT FILLER IN TOP 5 INCHES OF CURB AND INTERSECTION RETURN RADIUS POINTS.

THE CONTRACTOR SHALL, UNLESS OTHERWISE SHOWN ON THE PLANS, USE A BOXOUT AT MANHOLES AND OTHER ROADWAY APPURTENANCES OF SIMILAR OR LARGER SIZE.

PREFERRED TRANSVERSE JOINT LOCATIONS ARE: AT THE MIDPOINT OF ROUND BOXOUTS OR APPURTENANCES; OR AT THE CORNER OF RECTANGULAR BOXOUTS OR APPURTENANCES.

WHERE A LONGITUDINAL JOINT IS LOCATED ONE FOOT OR MORE CLEAR OF AN APPURTENANCE EDGE, A BOXOUT MAY BE USED. WITH LESS THAN THIS CLEARANCE, USE THE "TYPICAL 2' RADIAL JOINT" AS SHOWN IN THE DETAILS. USE THE SQUARE OR ROUND BOXOUT, OR BOND BREAKER, IS APPROPRIATE WHEN THE APPURTENANCE IS CENTERED ON A LONGITUDINAL JOINT.

THE FINAL FINISH REQUIREMENTS OF CDOH SPECIFICATIONS, SUBSECTION 412.15 (F) SHALL APPLY EXCEPT THAT TRANSVERSE TINED GROOVES WILL NOT BE REQUIRED WITHIN 2 FEET OF CURBS.

STANDARD CURB AND GUTTER WILL BE CONSTRUCTED SEPARATELY FROM CONCRETE PAVEMENT. AN EXPANSION JOINT WILL BE REQUIRED BETWEEN CURB OPENING INLETS AND CONCRETE PAVEMENT.

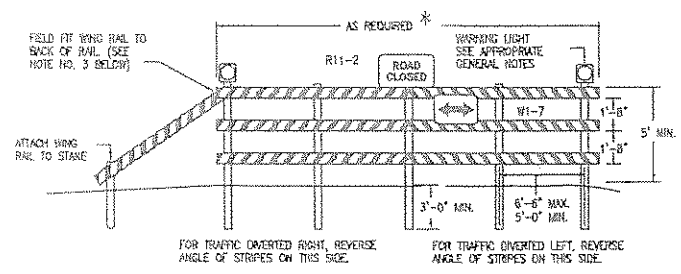


ROADWAY DESIGN STANDARDS

STANDARD DRAWING

CONCRETE PAVEMENT JOINT

36

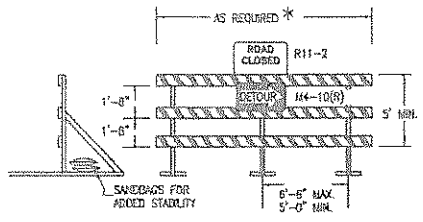


FIXED

RAIL LENGTH TABLE \*

TYPE 3 BARRICADE		LENGTH
FIXED	MOVABLE	
F - A	M - A	8' - 14'
F - B	M - B	15' - 24'
F - C	M - C	25' - 35'
F - D	M - D	> 35'

- NOTES
1. TYPE 3 BARRICADES HAVE 3 REFLECTORIZED RAIL FACES IF FACING TRAFFIC IN ONE DIRECTION AND 6 IF FACING TRAFFIC IN TWO DIRECTIONS.
  2. THE PORTION OF THE POST ABOVE THE GROUND LINE SHALL BE PAINTED IN ACCORDANCE WITH THE APPROPRIATE GENERAL NOTE.
  3. DETACHABLE EXTENSION WING RAILS FOR BYPASSING OF CONSTRUCTION EQUIPMENT ARE PERMITTED, WHEN NECESSARY, ON FIXED OR MOVABLE TYPE 3 BARRICADES. THE LENGTH SHALL BE ADEQUATE TO CLOSE THE BORROW PIT AND/OR SHOULDER AS REQUIRED.



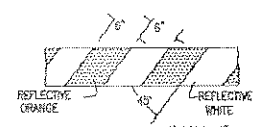
MOVABLE-SKIDS



MOVABLE-HINGED

TYPICAL BARRICADE CHARACTERISTICS

BARRICADE DESIGNATIONS	
TYPE 3	
RAIL WIDTH	8" MIN. - 12" MAX.
RAIL LENGTH	AS REQUIRED, SEE TABLE *
HEIGHT	5' MIN.
USE	TEMPORARY OR PERMANENT
STRIPES	SEE DETAIL OF BARRICADE STRIPING AND APPROPRIATE GENERAL NOTES.



RAIL STRIPING DETAIL

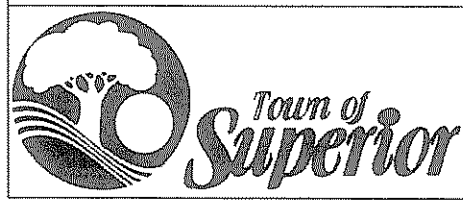
TYPICAL TYPE 3 BARRICADES

GENERAL NOTES

1. THE VARIOUS TYPES, COMBINATIONS AND APPLICATIONS OF SIGNS AND WARNING LIGHTS FOR BARRICADES REQUIRED FOR EACH PROJECT SHALL BE:
  - A. AS SPECIFIED OR DETAILED IN THE PLANS.
  - B. AS SHOWN IN APPLICABLE TYPICAL ILLUSTRATIONS.
  - C. AS CALLED FOR AND SUBJECT TO APPROVAL BY THE ENGINEER.
2. TEMPORARY AND PERMANENT BARRICADES TYPE 3 SHALL BE FABRICATED FROM APPROVED CRASH TESTED MATERIALS.
  - A. SEE SECTION 614 OF THE STANDARD SPECIFICATIONS FOR ROAD & BRIDGE CONSTRUCTION FOR ADDITIONAL REQUIREMENTS.
3. ALL PAINTING SHALL CONFORM WITH THE FOLLOWING:
  - A. THE APPLICABLE SUBSECTIONS OF 508 AND 614 OF THE STANDARD SPECIFICATIONS.
  - B. ALL SKIDS, BRACES AND POSTS SHALL BE PAINTED WITH 2 COATS OF "EXTERIOR WHITE PAINT"
  - C. THE BACKSIDES OF RAILS AND VERTICAL PANEL CHANNELIZING DEVICES FACING ONE DIRECTION OF TRAFFIC ONLY SHALL BE PAINTED WITH "EXTERIOR WHITE PAINT".
  - D. ALUMINUM OR GALVANIZED STEEL SKIDS, BRACES AND POSTS SHALL NOT BE PAINTED.

4. ALL STRIPED SURFACES SHALL CONFORM WITH THE FOLLOWING:
  - A. THE ENTIRE AREA OF ORANGE AND WHITE STRIPES SHALL BE FABRICATED.
  - B. HORIZONTAL RAILS, WING RAILS AND VERTICAL PANEL CHANNELIZING DEVICES SHALL HAVE ORANGE AND WHITE STRIPES ON THE FACE SIDE(S) SLANTING DOWNWARD AT A 45 ANGLE TOWARD THE SIDE(S) TO WHICH TRAFFIC IS TO PASS OR TURN.
  - C. PERMANENT BARRICADES SHALL HAVE REFLECTORIZED RED AND WHITE STRIPES. THEY MAY BE USED AT LOCATIONS TO MARK THE END OF A ROAD, STREET OR HIGHWAY WHERE THERE IS NO CROSSROAD OR OUTLET. THEY SHALL NOT BE USED AT A "T" INTERSECTION.
  - D. ALL RETRO-REFLECTIVE SHEETING SHALL CONFORM TO ASTM D4956:
    1. ORANGE AND WHITE SHALL BE TYPE II, III OR IV.
    2. RED AND WHITE SHALL BE TYPE II, III OR IV.
5. FOR ALL WOODEN BARRICADE COMPONENTS NOMINAL LUMBER DIMENSIONS ARE SATISFACTORY.
6. ALL SCREWS, BOLTS, NUT AND WASHERS SHALL BE GALVANIZED OR CADMIUM PLATED.

7. STABILITY OF BARRICADES AND CHANNELIZING DEVICES SHALL CONFORM WITH THE FOLLOWING:
  - A. SKIDS (BRACES) OF MOVABLE BARRICADES SHALL BE WEIGHTED WITH SANDBAGS ONLY WHERE NECESSARY TO PROVIDE STABILITY.
  - B. NO MOVABLE OR PORTABLE DEVICE SHALL BE WEIGHTED BY ANY METHOD OR WITH ANY MATERIAL THAT WOULD MAKE THEM HAZARDOUS TO MOTORISTS.
8. WARNING LIGHTS USED WITH BARRICADES, DRUMS AND VERTICAL PANELS SHALL CONFORM WITH THE FOLLOWING:
  - A. USE FLASHING WARNING LIGHTS WHEN DEVICES ARE USED SINGLY AND STEADY GLOW LIGHTS WHEN THEY ARE USED IN A SERIES FOR CHANNELIZATION.
  - B. THEY SHALL BE POSITIONED ABOVE THE TOP RAIL OF BARRICADES OR ON TOP OF DRUMS AND VERTICAL PANELS.
9. CONCRETE BARRIER (TEMPORARY) SHALL CONFORM WITH:
  - A. PRECAST CONCRETE BARRIER AS SHOWN ON STANDARD GUARD RAIL - TYPE 4 CONCRETE BARRIER.
  - B. BARRIER REFLECTORS SHALL BE INSTALLED THAT MEET THE REQUIREMENTS OF STANDARD TYPICAL DELINEATOR INSTALLATIONS, EXCEPT THE MAXIMUM SPACING SHALL BE 50', AND THEY WILL NOT BE PAID FOR BUT ARE INCLUDED IN THE COST OF THE BARRIER.
  - C. CONCRETE BARRIER END TREATMENT SHALL BE IN ACCORDANCE WITH CLEAR ZONE CRITERIA AND PLACED AS SHOWN ON THE PLANS.
10. SIGN PANELS MOUNTED ON BARRICADES ARE PAID FOR UNDER APPROPRIATE ITEM.

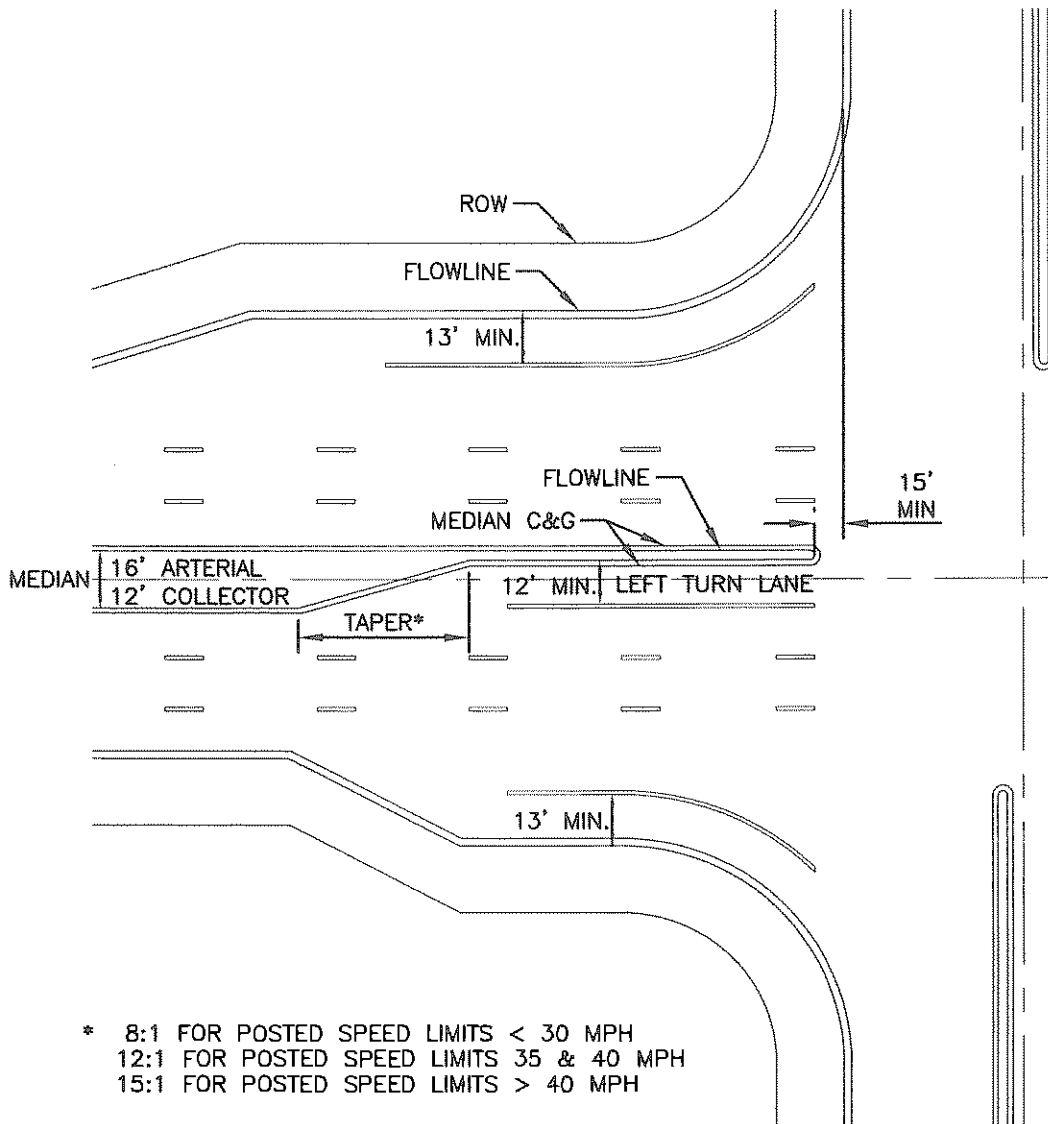


ROADWAY DESIGN STANDARDS

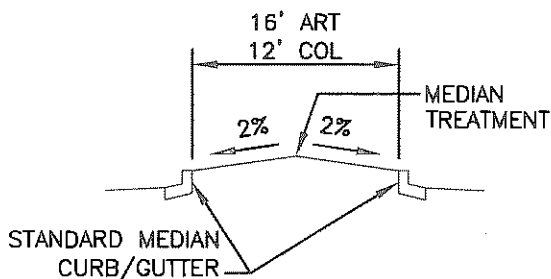
STANDARD DRAWING

STANDARD BARRICADE

37



\* 8:1 FOR POSTED SPEED LIMITS < 30 MPH  
 12:1 FOR POSTED SPEED LIMITS 35 & 40 MPH  
 15:1 FOR POSTED SPEED LIMITS > 40 MPH



#### NOTES:

1. TOP OF CURB TO BE LEVEL, INCLUDING DURING SUPERELEVATION. AT LEFT TURN LANES THERE WILL BE A VERTICAL DIFFERENCE BETWEEN THE TWO MEDIAN CURBS IN ORDER TO PROVIDE A TWO PERCENT (2%) CROSS SLOPE IN THE TURN LANE. ANY OTHER VERTICAL OFFSET IN THE TWO MEDIAN CURBS SHALL NEED TO BE APPROVED BY THE TOWN.

2. MEDIANS TO BE PAVED (DECORATIVELY TREATED CONCRETE) OR LANDSCAPED. MEDIAN TREATMENT TO BE APPROVED BY THE TOWN.

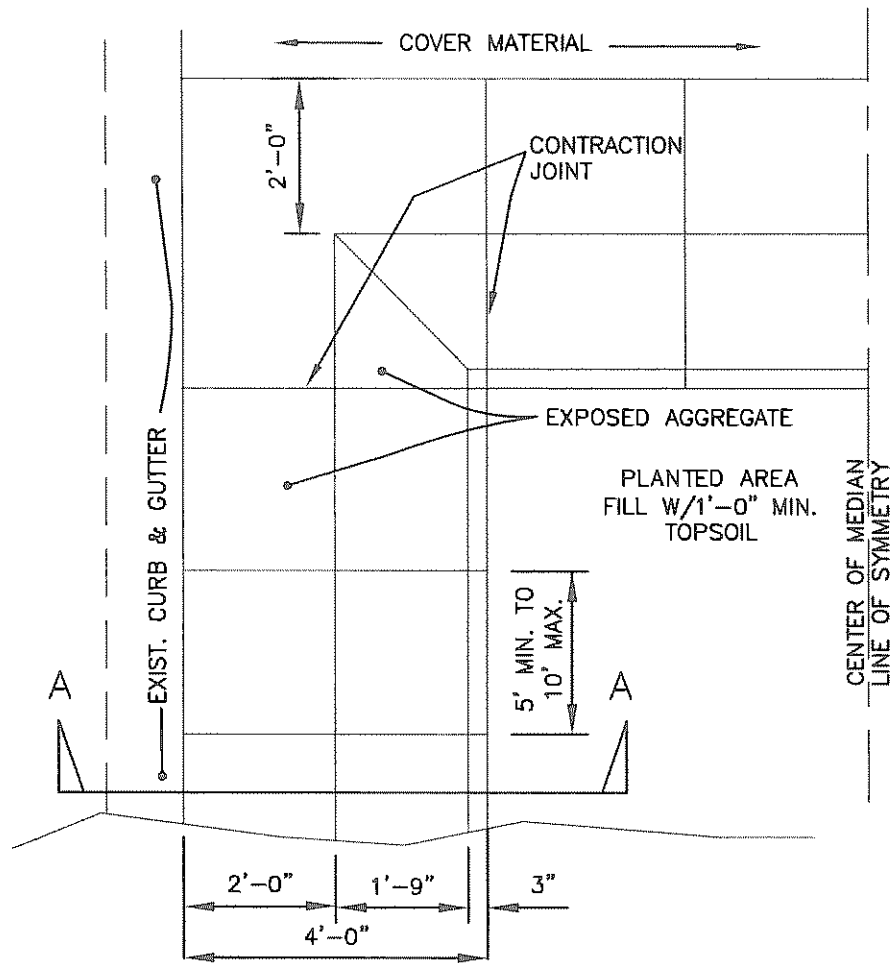


ROADWAY DESIGN STANDARDS

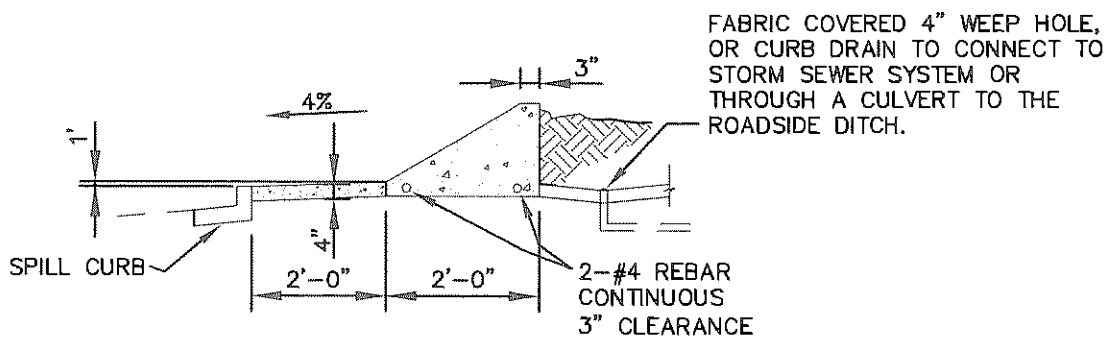
STANDARD DRAWING

STANDARD MEDIAN

38



PLAN



SECTION A-A

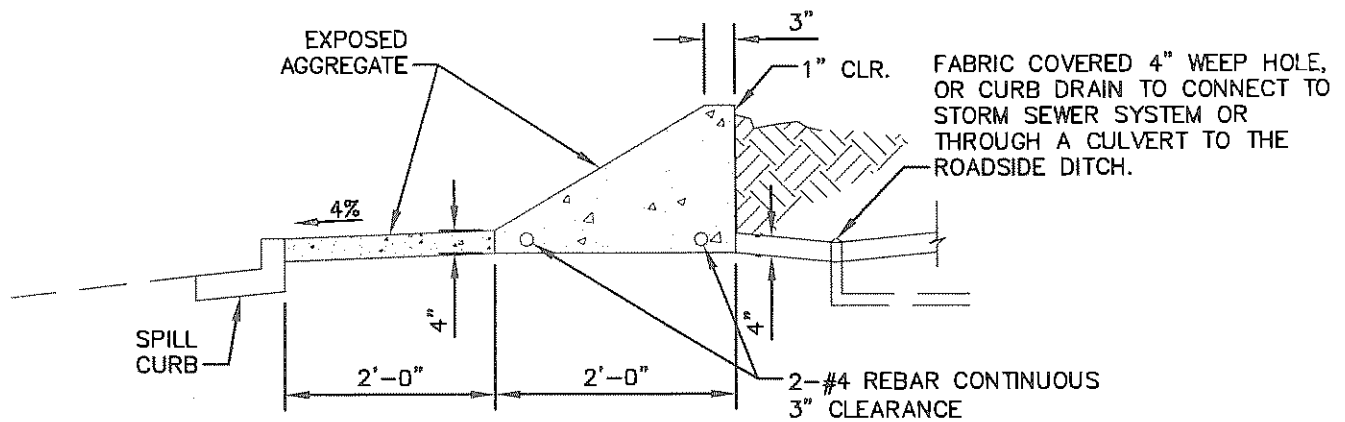


ROADWAY DESIGN STANDARDS

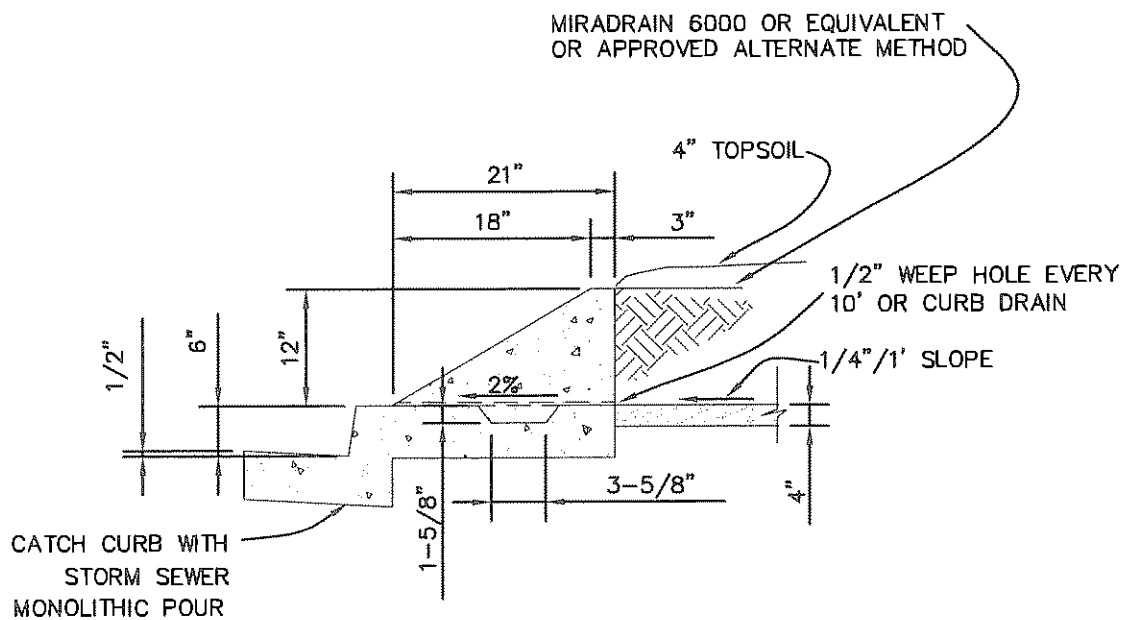
STANDARD DRAWING

MEDIAN PLANTER

39



THERE IS NO SETBACK REQUIREMENT FOR  
MEDIAN LANDSCAPING IF THE SLOPED  
PAVING DETAILS SHOWN HERE ARE USED.

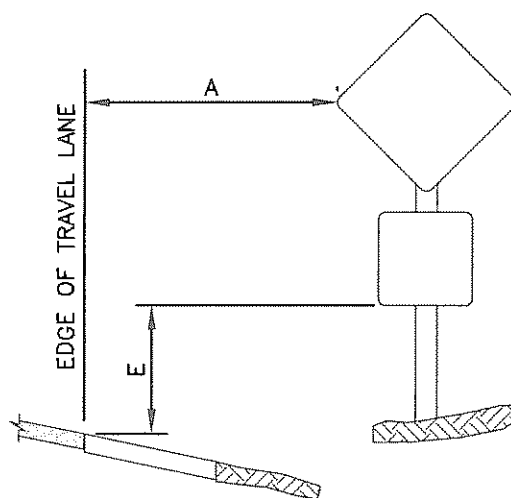
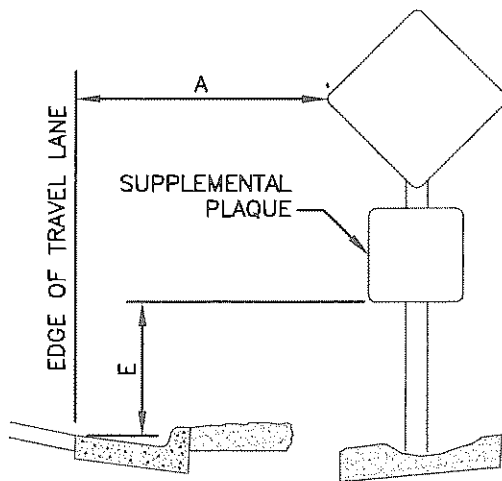
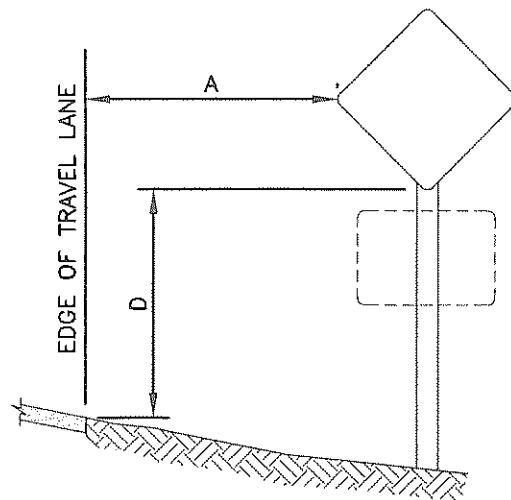
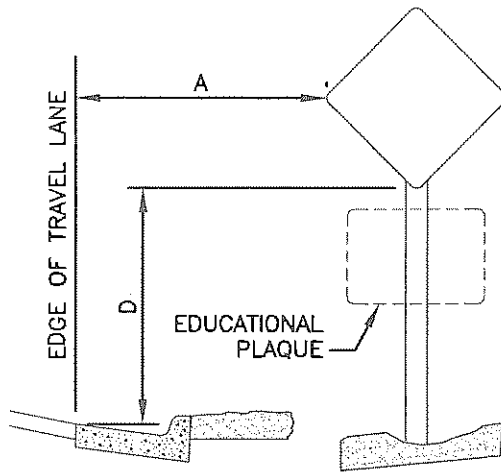


ROADWAY DESIGN STANDARDS

STANDARD DRAWING

MEDIAN PLANTER

40



NOTE: SEE STANDARD DRAWING 42 FOR DIMENSIONS A, D, & E

WARNING SIGN PLACEMENT



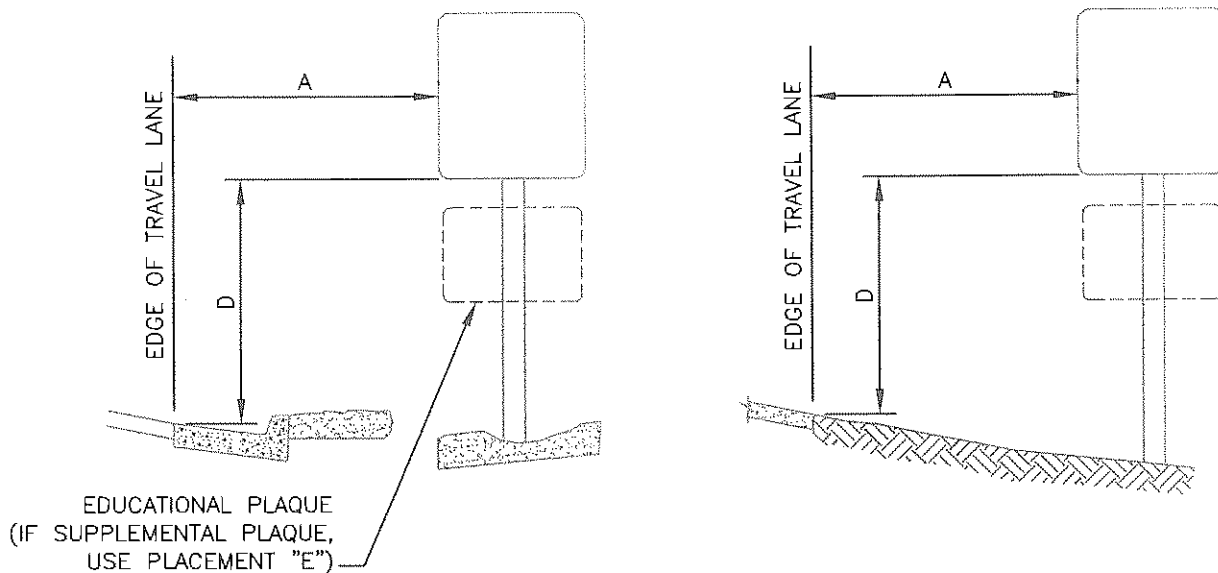
ROADWAY DESIGN STANDARDS

STANDARD DRAWING

SIGNAGE

41





### REGULATORY SIGN PLACEMENT

LATERAL PLACEMENT				
	LOCAL STREETS		COLLECTORS & ARTERIALS	
KEY	MINIMUM	NORMAL	MINIMUM	NORMAL
A	8'-0"	12'-0"	10'-0"	14'-0"

VERTICAL PLACEMENT (MINIMUM)				
	URBAN		RURAL	
KEY	WITH SIDEWALKS	W/O SIDEWALKS	WITH SIDEWALKS	W/O SIDEWALKS
D	7'-0"	7'-0"	N/A	5'-0"
E	7'-0"	6'-0"	N/A	4'-0"

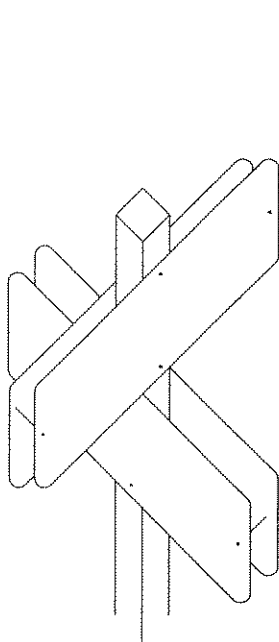
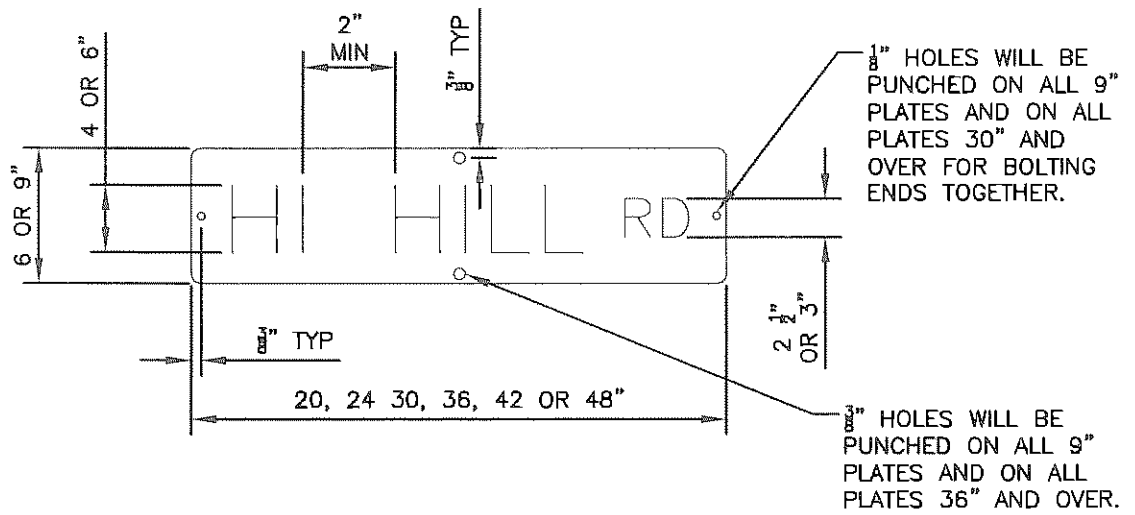


ROADWAY DESIGN STANDARDS

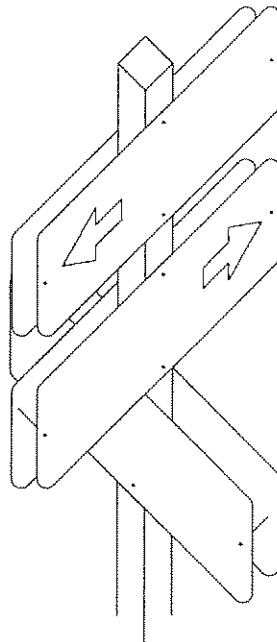
STANDARD DRAWING

SIGNAGE

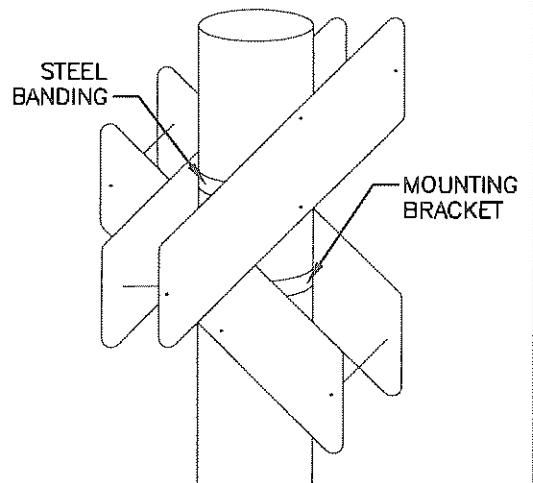
42



STANDARD  
STREET SIGN ASSEMBLY



STREET SIGN ASSEMBLY  
WHEN STREET NAMES CHANGE



STREET SIGN ASSEMBLY  
ON UTILITY POLE

STREET SIGN ASSEMBLY



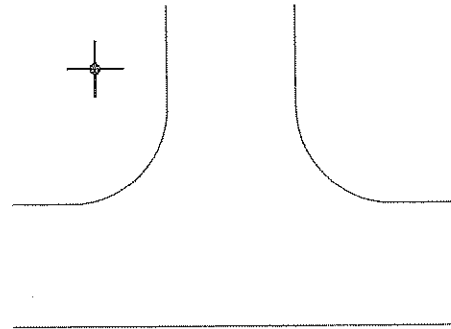
ROADWAY DESIGN STANDARDS

STANDARD DRAWING

STREET NAME SIGNAGE

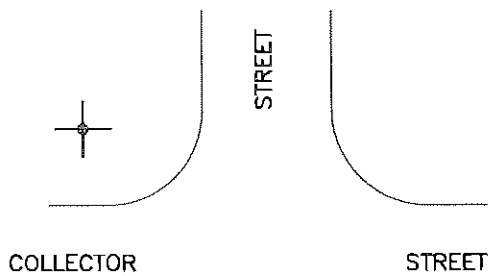
43

## T-INTERSECTION

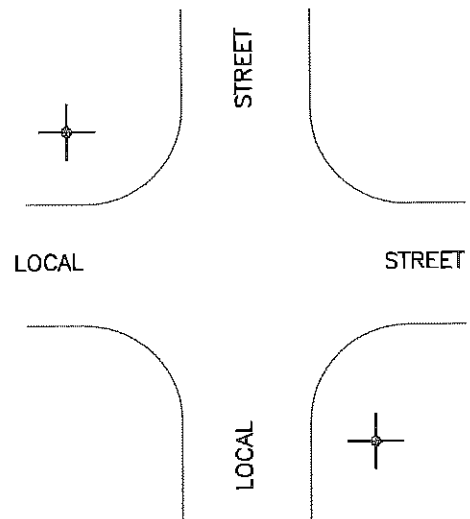


ASSEMBLY MUST BE PLACED AT THIS LOCATION.

## LOCAL-COLLECTOR STREET INTERSECTION



## LOCAL-LOCAL STREET INTERSECTION



NOTE:  
REFER TO THE MOST RECENT EDITION  
OF THE MANUAL OF UNIFORM TRAFFIC  
CONTROL DEVICES FOR ADDITIONAL  
INFORMATION.

## STREET NAME ASSEMBLY LOCATIONS

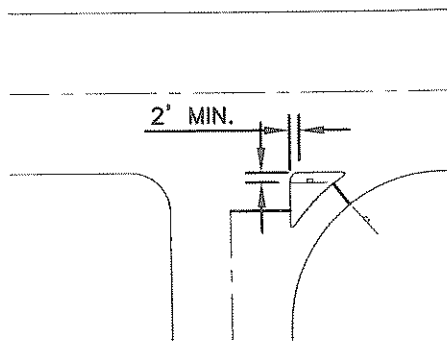


ROADWAY DESIGN STANDARDS

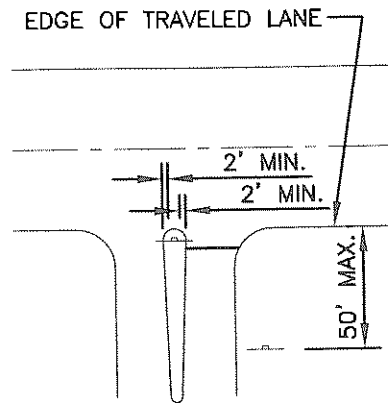
STANDARD DRAWING

STREET NAME SIGNAGE LOCATIONS

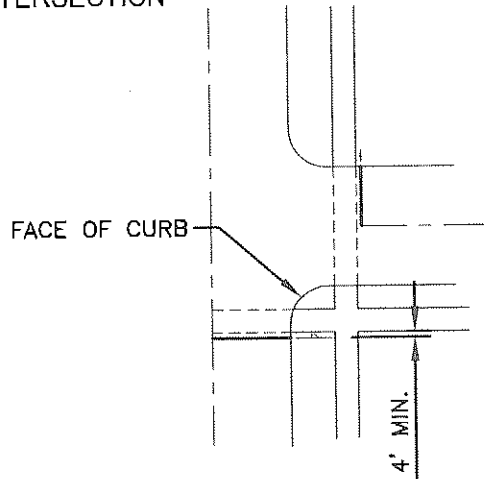
44



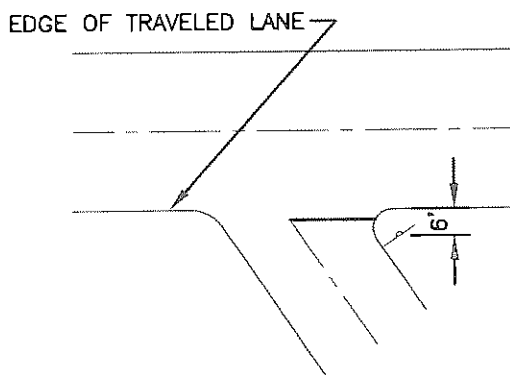
CHANNELIZED INTERSECTION



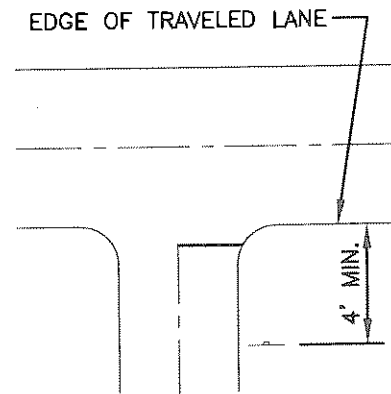
DIVISIONAL ISLAND



URBAN INTERSECTION



ACUTE ANGLE INTERSECTION



WIDE THROAT INTERSECTION

NOTE:  
REFER TO THE MOST RECENT EDITION OF THE MANUAL OF UNIFORM TRAFFIC  
CONTROL DEVICES FOR ADDITIONAL INFORMATION.

TYPICAL LOCATIONS - STOP SIGNS AND YIELD SIGNS



ROADWAY DESIGN STANDARDS

STANDARD DRAWING

STOP OR YIELD  
SIGNAGE LOCATIONS

45